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AIR POLLUTION ABSTRACTS

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 59707 - 61348.

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Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

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Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

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SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

MEASUREMENT METHODS

1976

59707 **APTIC NO. 83071**

Amiot, C. and G. Guelachvili

EXTENSION OF THE 10 TO THE 6TH POWER SAMPLES FOURIER SPECTROMETRY TO THE INDIUM ANTIMONIDE REGION: VIBRATION-ROTATION BANDS OF 14N2 160: 3.3 -- 5.5 MICRON REGION. *J. Mol. Spectr., 59(2):171-190, Feb. 1976. 9 refs.*

A high-information Fourier interferometer was modified to extend the spectral range. It is now possible to record spectra in the Indium Antimonide region extending to 5.5 micron with an apodized resolution of 5 times 10 to the -3rd power/cm. Typical results are described. Nitrous oxide vibration-rotation bands between 1800 and 3200/cm were measured and analyzed and rotational constants for 33 bands were calculated. (Author abstract modified)

59708 **APTIC NO. 83894**

Ayling, G. M. and H. Bloom

HEAVY METALS ANALYSES TO CHARACTERIZE AND ESTIMATE DISTRIBUTION OF HEAVY METALS IN DUST FALLOUT. *Atmos. Environ., 10(1):61-64, 1976. 7 refs.*

The use of heavy metals analyses to characterize and estimate distribution of heavy metals in dust fallout in Australia is described. Chemical analysis of heavy metals in the insoluble residue, collected in standard dust fallout gauges, enables both the source of dust to be identified and its distribution to be measured over a wide area. Characteristic metal such as manganese enables dust from a brick manufacturing industry to be distinguished from interference due to localized dust in a residential area. Analysis for cadmium, copper, lead, zinc, and other metals in dust show that dust is blown across residential areas more than 10 km from ore concentrate dumps. (Author abstract modified)

59709 **APTIC NO. 80541**

Barnard, William F.

COMMUNITY HEALTH ENVIRONMENTAL SURVEILLANCE STUDIES (CHESS) AIR POLLUTION MONITORING HANDBOOK: MANUAL METHODS. *Environmental Protection Agency, Research Triangle Park, N. C., Exposure Assessment Branch, Program Element 1AA601, Rept. EPA-600/1-76-011, 138p., Jan. 1976. 21 refs.*

Methods to be used by the Community Health Environmental Surveillance Studies program are described. The discussion of methods for total sspended particulates includes the hi-volume sampler, suspended nitrates, and suspended sulfates. Methods for respirable particulate are also discussed, including principle and applicability, range and sensitivity, interferences, precision and accuracy, and apparatus and procedures for sampling, analysis, and calibration. Principles and applicability, range and sensitivity, interferences, precision, accuracy, stability, efficiency, and sampling, analysis, and calibration apparatus and procedure are discussed for sulfur dioxide measurement. Most of these factors are also discussed for nitrogen dioxide bubblers.

59710 **APTIC NO. 82546**

Blaine, Roger L.

ASSAY NOXIOUS AND OBNOXIOUS POLLUTANTS USING THERMAL ANALYSIS TECHNIQUES. *Ind. Res., 18(3):52-56, March 1976. 22 refs.*

Thermal analysis techniques for measuring the vapor pressure of air pollutants are reviewed. Thermal analysis equipment is able to measure vapor pressures over a wide variety of sample conditions and vapor pressure ranges. These techniques include Thermal Evolution Analysis of the vapor pressures of organic materials as low as 10 to the -8th deg mm Hg, Thermogravimetric Analysis and Differential Scanning Calorimetry, and Pressure Differential Scanning Calorimetry (PDSC). The PDSC method is capable of measuring vapor pressures as high as 5 times 10 to the 4th mm Hg. As compared to more classical vapor pressure measurement techniques, thermal analysis is faster, uses smaller samples, is suitable for multiple uses, and has wide dynamic range.

59711 **APTIC NO. 80544**

Bombaugh, K. J., E. C. Cavanaugh, J. C. Dickerman, S. L. Keil, T. P. Neilson, M. L. Owen, and D. D. Rosebrook

SAMPLING AND ANALYTICAL STRATEGIES FOR COMPOUNDS IN PETROLEUM REFINERY STREAMS (VOLUME I) FINAL REPORT). *Radian Corp., Austin, Tex., Environmental Protection Agency Contract 68-02-1882, Task 32, Program Element 1AB015; ROAP/21AFH-025, Rept. EPA-600/2-76-012a, 137p., Jan. 1976. 63 refs.*

A general sampling and analytical strategy was developed for use in the identification of potentially hazardous components in process streams and waste streams. The strategy contains sampling, separation, and measurement phases with appropriate options for differing stream types. Sampling utilizes many common techniques and generally available equipment. The separation phase relies on liquid-liquid partitioning and various forms of column chromatography. Measurement primarily involves gas chromatography, gas chromatography/mass spectrometry, spark source mass spectrometry, atomic absorption spectrometry, and ion selective electrodes. The strategy was applied to five petroleum refinery streams: fugitive emissions from atmospheric crude distillation, aqueous condensate from an atmospheric crude still, effluent water from an API separator, tail gas from a sulfur recovery unit, and atmospheric emissions from a fluid catalytic cracking regenerator. Costs were developed for the application of the sampling and analytical strategy using a modular approach. The methodology for collecting and analyzing data is applicable to other types of process plants such as coal conversion and petrochemical units. (Author abstract modified)

59712 **APTIC NO. 82715**

Bongers, W.

METHODS FOR THE DETERMINATION OF HYDROCARBONS IN THE ATMOSPHERE. *Stichting CONCAWE, The Hague (Netherlands), Special Task Force on the Study of Air Pollution, Sampling and Survey Techniques, Rept. 3/76, 28p., Feb. 1976. 71 refs.*

Methods for the sampling and analysis of atmospheric hydrocarbons are reviewed. The methods include: sampling with and without preconcentration, infrared spectrometry, mass spectrometry, gas chromatography, colorimetry, chemiluminescent procedures, and automatic field methods. Special methods are outlined for the determination of ethylene, benzene, total hydrocarbons, methane, and reactive hydrocarbons. The preparation of calibration gas mixtures is also reviewed.

59713 **APTIC NO. 82335**

Byers, R. L.

ON SITE REDUCTION OF SOURCE SAMPLING DATA BY MEANS OF A PROGRAMMABLE FIELD CALCULATOR. *J. Air Pollution Control Assoc., 26(2):143-145, Feb. 1976. 3 refs.*

Computerized processing of source sampling data using a handheld programmable electronic calculator is described. A magnetic card preprogrammed with the isokinetic equations not only makes it possible to include all variables in the calculation of isokinetic conditions but permits rapid determination of the sampling rate adjustment needed to compensate for changes in these variables. A program was written to calculate the orifice constant and dry gas meter correction for each orifice setting. Individual values of these constants are stored and averaged. A program relating anticipated stack temperatures, pressure, duct velocity, flue gas particulate concentration, and desired particulate catch allows one to rapidly optimize probe tip diameter and sampling rate in order to achieve a desired particulate catch in the shortest sampling time possible. Using a preprogrammed tape, isokinetic calculations can be done within minutes after a test has been completed. Where analytical facilities are available for determining the particulate catch in the field, it is possible, by the use of preprogrammed tapes, to calculate one day s test results before the next day s testing begins. It is possible to determine particle cut diameters while in the field within minutes after a sample has been obtained by incorporating impaction equations into a programmable tape. These and three other preprogrammed tapes make it possible to reduce the data for a single stack test for particulate matter in about 15 to 20 min. The data reduction can be done on site within minutes after the analytical data become available.

59714 **APTIC NO. 83556**

Chau, Y. K., P. T. S. Wong, and H. Saitoh

DETERMINATION OF TETRAALKYL LEAD COMPOUNDS IN THE ATMOSPHERE. *J. Chromatographic Sci., 14(3):162-164, March 1976. 12 refs.*

A gas chromatographic atomic absorbance method for the separation and determination of five lead tetraalkyls in air at microgram level is described. It is fast, sensitive, and relatively specific. The volatile Pb compounds are first collected by a cold trap containing OV-1 at - 80 C, swept into the gas chromatograph, and the effluent is ducted to an atomic absorbance unit for analysis. At normal atomic absorbance sensitivity (1X), 0.1 microgram of each of the Pb alkyls was determined with certainty. (Author abstract modified)

59715 **APTIC NO. 83893**

De Greef, J., M. De Proft, and F. De Winter

GAS CHROMATOGRAPHIC DETERMINATION OF EHTYLENE IN LARGE AIR VOLUMES AT THE FRACTIONAL PARTS PER BILLION LEVEL. *Anal. Chem., 48(1):38-41, Jan. 1976. 13 refs.*

The use of gas chromatographic determination of ethylene in large air volumes at the fractional ppb level is discussed. Ethylene is trapped with 100% efficiency from large volumes of air on a Porapak precolumn cooled at -95 C. The precolumn is built in a gas sampling apparatus operated by a two-way six-port rotary valve. After being loaded, the column is introduced into the carrier gas stream. The ethylene is totally released and swept onto the analytical column with the carrier gas by heating the column to 100 C with boiling water. By this method and using a standard commercial instrument, concentrations of ethylene as low as 0.1-0.01 ppb are measured in a quantitative and reproducible manner. (Author abstract modified)

59716 **APTIC NO. 82589**

Dennis, Richard

INTRODUCTION: OBJECTIVES, ORGANIZATION, AND APPLICATIONS. *In: Handbook on Aerosols. Richard Dennis (ed.), U. S. Energy Research and Development Administration, 1976, Chapt. 1, p. 1-8. 56 refs.*

NTIS: TID-26608

Dusts, fumes, smokes, mists, and fogs, as well as aerosols, are discussed. Size distribution parameters are discussed as they affect experimental and measurement procedures. There are significant differences between the various mean and median diameters. Only a two-dimensional projection of a particle is seen with a microscope; consequently any highly irregular form is poorly represented. Particle irregularities can also create difficulties in light-scattering measurements. Instruments that fractionate a particulate cloud on the basis of the inertial properties of its components probably give, in many respects, the best practical assessment of size. The application areas of aerosol technology are briefly discussed.

59717 **APTIC NO. 82593**

Fenn, Robert W.

OPTICAL PROPERTIES OF AEROSOLS. *In: Handbook on Aerosols. Richard Dennis (ed.), U. S. Energy Research and Development Administration, 1976, Chapt. 4, p. 66-92. 122 refs.*

NTIS: TID-26608

Measurements of the optical, or light-scattering, properties of aerosol particles are used to determine such properties as particle size, concentrations, refractive index, and shape. Light-scattering measurements avoid direct physical contact with physically and chemically unstable particles. Exact theoretical solutions exist for the light-scattering properties of various simple particle shapes; thus accurate and reliable data on small particles can be derived from light-scattering measurements. Geometrical optics laws can describe light scattering by particles which are large compared with the wavelength of the incident light. As the particle diameter approaches the wavelength of the incident light, the problem can only be solved using Maxwell s wave equations. Light scattering also depends on the particle shape and orientation with respect to the incident light and the direction of observation. The reflection properties of a particle depend in part on its surface characteristics. The refractive index of the particles also affects their light scattering properties. The refractive index may vary through the particle. Single particles and monodisperse aerosols, polydisperse aerosols, and optical measurements are discussed. (Author abstract modified)

59718 **APTIC NO. 81904**

Gooding, Charles H.

WIND TUNNEL EVALUATION OOF PARTICLE SIZING INSTRUMENTS (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1398, Program Element 1AB012, ROAP 21ADL-18B, Task 23, Rept. EPA-600/2-76-073, 71p., March 1976. 5 refs.*

Several particle sizing instruments were evaluated by redispersing and feeding fly ash from a coal-fired power plant into a wind tunnel at concentrations corresponding roughly to clean and dirty stack conditions. Brink and Andersen impactors and series cyclones yielded comparable results for particle size distribution measurements of the fly ash. A cascade impactor with piezoelectric sensors yielded results that were consistent with those of the above two devices; however, the extractive testing procedure resulted in an absence of data from the first three of the 10 impactor stages due to sample line losses. Data from the last three of the 10 stages were also lost because a measurable mass of particulate could not be collected on these stages without overloading the middle stages. A cascade compactor using beta attenuation to determine collected mass showed general agreement with the first two methods but presented problems associated with zero stability, sensitivity, signaltto-noise ratio, and scale conversion from beta attenuation to collected mass. Particle size distributions obtained with an optical single- particle counter using a laser light source did not agree with those obtained from the first two methods due to the probable nonuniformity of particle shape and density. (Author conclusions modified)

59719 **APTIC NO. 81888**

Harris, D. Bruce

TENTATIVE PROCEDURES FOR PARTICLE SIZING IN PROCESS STREAMS - CASCADE IMPACTORS (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Industrial Environmental Research Lab., Program Element 1AB012, ROAP 21ADM-012, Rept. EPA-600/2-76-023, 61p., Feb. 1976. 4 refs.*

Tentative procedures for using cascade impactors to determine particle size distributions in industrial process streams are presented. The procedures include: presurvey information, equipment selection and preparation, information on collection substrates and adhesives, sampling and post-sampling procedures, and data analysis. A review of specific commercial impactors is also presented. Appendices provide information dealing with brink orifice calibration, design drawings, cost estimating data sheets, preliminary surveys, stack data sheets, safety checklists, and metric system conversion factors.

59720 **APTIC NO. 82697**

Harris, Franklin S., Jr.

ATMOSPHERIC AEROSOLS: A LITERATURE SUMMARY OF THEIR PHYSICAL CHARACTERISTICS AND CHEMICAL COMPOSITION. *Old Dominion Univ., Norfolk, Va., National Aeronautics and Space Administration Contract NGR 47-003-068, Rept. NASA CR-2626, 44p., Jan. 1976. 199 refs.*

A summary of 199 recent references on the characterization of atmospheric aerosols with respect to their chemical composition, sources, size distribution, physical properties, and time changes is presented. Analytical methods covered include: electron microscopy, X-ray fluorescence, neutron activation analysis, emission spectrometry, flame photometry, infrared spectrometry, and optical microscopy. The methods are applicable to ambient measurements as well as to source monitoring. (Author summary modified)

59721 **APTIC NO. 82293**

Karasek, F. W.

FLUORESCENCE SPECTROSCOPY. *Res. Dev., 27(1):28-30, 32, 34, Jan. 1976. 17 refs.*

Fluorescence spectroscopy has assumed a major analytical role because of its sensitivity, selectivity, and linearity. Two spectra are available, an excitation and an emission spectrum. The instrumentation comprises the same basic elements for both spectra: optical systems to direct the excitation light through the sample and to measure the fluorescent radiation. Both spectral regions can be selected by the use of simple filter photometers. The greatest analytical scope of the technique is achieved using spectrophotometers to give scanable wavelength selection from 200 to 800 nm, the most useful region for the fluorescence technique. Fluorescence measurements can be used after chromatography to detect polycyclic aromatic hydrocarbons(PAH) in polluted air. A very sensitive fluorometric assay technique has been developed to study the metabolism of PAH carcinogens in biological systems. A new technique giving highly characteristic and extremely well-resolved fine-structure emission spectra is based on the Shpolskii effect. Two types of inorganic fluorometric methods are described. Because fluorescence intensity is proportional to excitation energy, using lasers for excitation offers many possibilities for great sensitivity. Other types of fluorescence also have analytical importance. The continuous analysis of carbon monoxide by infrared absorption uses two very narrow, specific infrared bands created by fluorescence generated in a source cell filled with equal amounts of CO16 and CO18. X-ray fluorescence is widely used for elemental analysis of solid samples.

59722 **APTIC NO. 82473**

Kendall, D. R.

ESTIMATION OF COMPLIANCE BY GASEOUS POLLUTANT EMISSIONS FROM ROUTINE CONTINUOUS MONITORING DATA. *TAPPI, 59(1):123-126, Jan. 1976. 11 refs.*

Problem areas in the estimation of compliance of gaseous pollutant emissions from routine continuous monitoring data are discussed. The problems are daily estimation of accuracy and precision, and response time error. A method for assessing data usability with respect to the amount of response time error is suggested. A logical approach to answering the compliance question, based on the probability that the true concentration exceeds the regulator limit, is presented. (Author abstract modified)

59723 **APTIC NO. 83438**

Knapp, K. T., R. L. Bennett, and R. B. Kellogg

SULFUR ANALYSIS OF AIR POLLUTION SAMPLES CONTAINING SULFURIC ACID WITH A VACUUM X-RAY FLUORESCENCE SPECTROMETER. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C. and Northrop Services, Inc., Research Triangle Park, N. C., 8p., 1976 (?). 1 ref.*

A procedure for avoiding sulfuric acid interference in emission samples collected from automobiles equipped with catalytic converters and analyzed for particulate content by X-ray fluorescence spectrometry is described. The technique fixes the sulfuric acid so that it remains on the filters and thus avoids contamination of the spectrometer. Sample filters are exposed side up in a desiccator, and a small beaker about half full of concentrated aqueous ammonia is placed in the center of the dessicator. The cover of the desiccator is then replaced with the vent open. The samples are exposed to the ammonia for several minutes to fix the sulfuric acid on the filters and prevent pumping problems in the spectrometer. Results obtained with samples exposed to ammonia at various concentrations over different time intervals are presented.

59724 **APTIC NO. 82958**

Kohda, Yasuo

NOX ANALYZER BY CHEMILUMINESCENCE. *(Kagaku hakkoho ni yoru NOx bunsekikei). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 43(1):60-66, Jan. 1976. 1 ref.*

Environmental standards for nitrogen dioxide (NO2) established as 0.02 ppm/day in 1973 must be met within 5 years, because the emission of nitrogen oxides (NOx) contributes to the generation of photochemical smog. Regulations for total NOx emission is also imminent in some local administrations. This trend of stricter regulations for NOx necessitates a continuous measuring of NOx. An atmospheric pressure type chemiluminescent method NOx meter, NOa-3O2A (low range, 0-50 ppm), developed by Shimazu Seisakusho in March 1975 is introduced. This NOx meter is low priced, requires simple maintenance, and has a low running cost. The atmospheric pressure type chemiluminescent method is described with the NOA-3O2A model as an example.

59725 **APTIC NO. 83079**

Kumar Ghosh, Anil, Dwarika Prasad Rajwar, Pankaj Krishna Bandyopadhyay, and Salil Kumar Ghosh

CONCENTRATION TECHNIQUE FOR DETERMINATION OF AIR POLLUTANTS AT SUB-MICRO LEVEL. A NEW TECHNIQUE FOR CONCENTRATION OF CARBON MONOXIDE. *J. Chromatog., 117(1):29-34, Feb. 4, 1976. 14 refs.*

The advantages, scope, and limitations of a step-wise technique for concentrating permanent gases, particularly carbon monoxide, up to 2000 times before gas chromatographic, spectrophotometric, or mass spectrometric determination are described. Less than 0.01 ppm of CO can be determined with an error of + or -10% by using this pre-concentration technique, followed by gas chromatography, with catalytic conversion of the CO into methane before flame ionization detection. The system used without pre-concentration cannot detect less than 1 ppm of CO. (Author summary modified)

59726 **APTIC NO. 83518**

LaCroix, D. E. and N. P. Wong

A SIMPLE COLLIMATING LENS SYSTEM FOR FLAMELESS ATOMIC ABSORPTION SPECTROSCOPY. *Spectrosc. Lett., 9(1):31-38, 1976. 8 refs.*

A simple collimating lens system is used to modify, at modest cost, a flame atomic absorption spectrophotometer for performing flameless atomic absorption spectrophotometry analysis with the Varian Model 63 Carbon Rod atomizer. The source light is collimated into a 3 mm diameter beam which passes through the carbon tube and is focused by a second lens to work efficiently with the monochromator. The modified atomic absorption spectrophotometry analysis techniques extends the capability of the flame atomic absorption spectrophotometer to make possible analyses of trace elements. Good correlation of values for zinc, iron, copper, and manganese are obtained by use of the National Bureau of Standards Standard Reference Material Orchard Leaves. (Author abstract modified)

59727 **APTIC NO. 83832**

Mamuro, Tetsuo

CONTINUOUS SIMULTANEOUS ANALYSIS OF GASEOUS AND PARTICLE TYPE SULFUR IN ATMOSPHERE. *(Taikichu kitaijo oyobi ryushijo iou no renzoku doji bunseki). Text in Japanese. Kagaku Kogyo (Chem. Ind.), 20(2):91-94, Feb. 1976. 9 refs.*

The Osaka Metropolitan Central Institute of Radiography introduces a continuous simultaneous analyzing method for airborne gaseous and particulate sulfur which has been developed and is almost ready for actual use. The analytic method consists of an air sampling device which has a membrane filter and an alkali permeation filter in the filter holder to simultaneously collect sulfur contained in suspended particulate and airborne sulfur dioxide and a fluorescent X-ray device which is either energy dispersion type or non-dispersion type using a semiconductor detector. Testing of the continuous simultaneous analysis of airborne sulfur dioxide and sulfur contained in the suspended particulate was conducted for a sampling duration of 60 min at a suction velocity of approximately 18 l/min. There is a very close correlation between the concentration of sulfur dioxide and that of sulfur contained in suspended particulate, and the concentration of gaseous sulfur is greatly dominated by meteorological conditions while the concentration of solid sulfur is independent of meteorological conditions. Also the analytic sensitivity for particulate sulfur and sulfur dioxide was 0.6 microgram/cu m and 3 ppb respectively.

59728 **APTIC NO. 82614**

Orr, Clyde, Jr. and Edward Y. H. Keng

SAMPLING AND PARTICLE-SIZE MEASUREMENT. *In: Handbook on Aerosols. Richard Dennis (ed.), U. S. Energy Research and Development Administration, 1976, Chapt. 5, p. 93-117. 143 refs.*

NTIS: TID-26608

Several criteria are involved in selecting sampling and particle size-measurement techniques: the appropriateness of the sampling method with respect to the precise information desired, the representativeness of the sample, and the sometimes inseparable features of the sampling and sizing functions with certain devices. If the particles are small or of low density, a sample sufficiently representative for most purposes can be obtained from quiescent aerosol at or near atmospheric pressure with moderate aspiration irrespective of the direction in which the sampling probe is pointing. Representative samples of the particles carried by constant-velocity gas streams can be extracted by adjusting the sampling velocity to equal that of the main stream. Methods and techniques discussed include gravity settling, filtration, impaction, impingement, centrifugation, precipitation, and condensation nuclei counters. The discussion of size and number determination includes optical methods, sieving with metal grids, fractionation by plastic membranes, sedimentation, light scattering and transmission, condensation nuclei counters, electrical properties, impaction, centrifugal classification, diffusion battery, acoustic, thermal force, gas adsorption, and spectrothermal emission. After aerosol size data have been obtained for a specific system, statistical methods are required to impart quantitative meaning and utility to the measurements. Equations are given for the count mean diameter, the geometric standard deviation, and the number standard deviation, which is the most commonly used measure of spread in a frequency distribution. Tabular presentation of size data can show either particle size versus cumulative frequency greater or less than specific sizes or particle size range versus weight or number frequency within the range. It is often more informative and more convenient to express size frequencies as percentages of the total number of measurements. Distribution equations are discussed, including the normal distribution function, the log normal distribution function, and bimodal and multimodal distribution functions.

59729 **APTIC NO. 84275**

Reiter, Reinhold, Karl Poetzl, and Michael Littfass

FULLY AUTOMATIC PRE-ASSEMBLED CONTROLLABLE RETENTION SIMULATOR WITH ELECTRONIC DATA PROCESSING. *(Vollautomatischer, fertigungsbezogen steuerbarer Retentionssimulator mit elektronischer Datenverarbeitung). Text in German. Staub, Reinhaltung Luft, 36(2):69-72, Feb. 1976. 2 refs.*

A computerized simulation of aerosol retention in the trachael, bronchial, and alveolar areas is described. Expiration rates can also be computed, either on the basis of an internal time program fed into the computer, or controlled externally from an industiral production unit. The sampling intervals with this electronic data processing and data output can be very short, a minimum of 5 minutes. Data output consists of tables and punched tapes. Case studies illustrate the use of the unit. Typical variations of retention behavior and coagulation tendencies characteristic of industiral aerosols are presented.

59730 **APTIC NO. 82474**

Scott, Arthur F. and Carol McCarthy

A COLORIMETRIC PROCEDURE FOR MEASURING MERCURY IN AIR. *Chemistry, 49(1):24-25, Jan.-Feb. 1976.*

A colorimetric procedure for measuring mercury in air was developed. Cuprous tetraiodomercurate is precipitated from the sampling solution. This copper compound is pink orange. By producing it in standard solutions of mercury and then comparing color intensities obtained from air sample solutions, the Hg concentration in air can be estimated within 10%. The procedure is applicable to Hg concentrations ranging from 1-100 microgram/ 5 ml of sampling solution.

59731 **APTIC NO. 83597**

Shewchun, J., B. K. Garside, E. A. Ballik, C. C. Y. Kwan, M. M. Elsherbiny, G. Hogenkamp, and A. Kazandjian

POLLUTION MONITORING SYSTEMS BASED ON RESONANCE ABSORPTION MEASUREMENTS OF OZONE WITH A TUNABLE CO2 LASER: SOME CRITERIA. *Appl. Optics, 15(2):340-346, Feb. 1976. 18 refs.*

Measurements of ozone made with a line tunable carbon dioxide laser established useful criteria for pollution monitoring via the direct absorption scheme. The absorption coefficient alpha and the pressure dependence of the extinction coefficient kv (P) at frequencies v corresponding to the P(8) to P(36) vibration rotation lines of the CO_2 laser were measured. Good agreement was found with theory (within the framework of Lorentz and Doppler broadenings) for these experimental observations. Foreign gas species lines within + or - 0.1/cm of the laser line contributed significantly to the absorption process if their absorption intensities were not more than an order of magnitude below the intensity of the gas species being monitored. (Author abstract modified)

59732 **APTIC NO. 83263**

Stedman, D. H.

MEASUREMENT TECHNIQUES FOR THE OZONE LAYER. *Res. Dev., 27(1):22-24, 26, Jan. 1976. 20 refs.*

Chlorine and oxides of nitrogen destroy ozone through chemical reactions. If, through human activities, the destruction rate is increased, the steady-state concentration will decrease; however, there is a strong feedback mechanism, such that a doubling of the removal rate leads only to about a 10% reduction in amount. An inert gas in the troposphere will ultimately make its way to the upper stratosphere and be photodissociated. The atmospheric density gradient moves or keeps gaseous species close to the ground. Although there is uncertainty regarding the quantitative value of ozone depletion, or its time scale, there is no controversy on the qualitative process whereby fluorocarbons 11 and 12 disperse into the atmosphere and are dissociated to chlorine atoms, which destroy ozone. Several measurements are required to assess man s impact on the ozone layer. Vertical profiles of hydrochloric and nitric acids have been measured using aircraft carrying filters. In situ measurements of stratospheric parameters are difficult. A chemiluminescence detector can respond to the presence of nitric oxide with excess O_3 provided or to O_3 with excess NO provided. The overall efficiency factor that must be applied to a real NO detector is approximately 10 to the -10th power. Nevertheless, ppb detection can be carried out with well-designed equipment. To determine nitrogen dioxide using chemiluminescence, NO_2 is converted to NO and total nitrogen oxides measured. Nitrogen dioxide is determined by subtracting NO from the total. Modern measurement techniques make possible direct determination of all important stratospheric reactants.

59733 **APTIC NO. 83772**

Stedman, Donald H.

A FLOW INDEPENDENT PROCEDURE FOR THE GAS PHASE TITRATION OF AN OZONE SOURCE. *J. Air Pollution Control Assoc., 26(1):62, Jan. 1976. 7 refs.*

A flow independent procedure for the gas phase titration of an ozone source is described. The first step is to remove the nitric oxide sources and use the O_3 source as a zero gas for the NO detector. The second step is to remove the O_3 source and plug thhe inlet. The NO flow up is turned to slightly greater than the NO detector requirements. The reading R(cal) is set on the 100 ppm full scale. The O_3 source is added and the NO flow turned down until the NO detector gives a stable reading close to 1/2 scale on 1 ppm full scale, R(NOx). As the O_3 source lamp is periodically energized and de-energized, a square wave results on the record with a lower reading R(NOx), and an upper reading (R(NO).

1975

59734 **APTIC NO. 82270**

Abe, Sotsuo, Yoshihiro Miyamoti, Takeo Ogigubo, and Shigeharu Oki

CONTINUOUS MONITORING OF AEROSOLS. *(Endo haigasuchu no baijin nodokei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):326, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 69.)*

A continuous dust monitoring apparatus is described. The correlation of its measurement with the JIS method (non-continuous method) was examined. The apparatus works by the light scattering method; its relative sensitivity is 10 microgram/cu cm for 1 cpm. The output can be read directly on a digital meter or on a connected recorder. No pump is used for sample air introduction, which is done by the pressure of the flue gas at the rate of 5 to 25 m/sec, which corresponds to about 50 l/min. The correlation between this apparatus and the JIS method for the measurement of flue gas dust concentrations was satisfactory; the correlation factor ranged from 0.74 to 0.88.

59735 **APTIC NO. 84175**

Aburamoto, Yukio and Kazuyasu Shimada

PROBLEM AND ITS SOLUTION IN SAMPLING BY THE ATP METHOD. *(ATP ho ni yoru sanpuringu no mondaiten to sono kairyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):287, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 25.)*

The loss of sodium fluoride from filter paper used in the adenosine triphosphate method was studied. Sodium fluoride was added to a filter paper to give 300 microgram fluoride, which was then exposed to the atmosphere for 1 month. At the end of the exposure, the fluoride remaining on the filter was 45 to 74% less than the initial amount. When 100 microgram fluoride was added to a filter paper, there was 4 to 47% less than the initial fluoride amount after 1 month exposure. The loss of fluoride compounds from the filter paper can be neglected during exposure. Three cylindrical filter papers were put together, and the lower two cylinders were wrapped with a vinyl cover, which was then exposed in the atmosphere near an aluminum refinery. After a 1-month exposure, the fluoride on each cylindrical filter paper was determined. The fluoride detected from the bottom cylinder was less than 20 microgram/50 sq cm paper/month. The middle cylinder had 38 to 78 microgram, and the top cylinder had 194 to 378 microgram. Thus, wrapping the filter paper with a vinyl cover prevented the loss of fluoride compounds.

59736 **APTIC NO. 82508**

Afanas ev, M. I., L. V. Denisova, T. I. Lomovtseva, B. P. Okhotnikov, V. A. Rotin, and V. S. Yusfin

DETERMINING MICROQUANTITIES OF HYDROGEN SULFIDE IN NATURAL GAS STREAMS. *(Opredelenie mikroprimesey serovodoroda v potoke prirodnogo gaza). Text in Russian. Zavodsk. Lab. (Moscow), 41(10):1202-1203, 1975. 4 refs.*

A sampling method and apparatus for the gas-chromatographic determination of hydrogen sulfide in natural gas is described. Hydrogen sulfide is adsorbed in a two-stage sampler on silica gel ASM impregnated with silicone liquid PMS-100. Adsorption is done at 20-25 C, and desorption for gas-chromatographic determination is done at 230-240 C. Cumulation factors of 1500-2000 relative to the SO_2 concentration in the natural gas are reached.

59737 **APTIC NO. 80491**

Ali, Latif H.

METHOD FOR THE DETERMINATION OF ELEMENTAL SULPHUR IN BITUMEN. *Fuel, 54(4):241-244, Oct. 1975. 1 ref.*

The absorption in the range lambda equals 262 nm (in cyclohexane) of elemental sulfur (Sel) added to bitumen extracted from Athabasca tar sands, at concentrations ranging from 0.2 to 4.0%, was used to determine its concentration with a reasonable accuracy. The selective concentration of Sel in a small fraction of the total bitumen was determined by chromatography on charcoal, eluting with a light naphtha. The concentration of Sel in the naphtha-soluble fraction of bitumen was determined by the reduction in the absorption at lambda equals 262 nm obtained before and after extracting this fraction with a 30% aqueous sodium sulfide solution and by the use of a preconstructed calibration curve. (Author abstract modified)

59738 **APTIC NO. 82630**

Anderson, Jerry A. and John O. Ogren

DATA PROCESSING TECHNIQUES FOR ACCURACY OF AIRCRAFT SAMPLING. *Preprint, Meteorology Research, Inc., Altadena, Calif., 11p., 1975. 11 refs.*

Data processing techniques associated with the aircraft sampling of point and area source plumes are reviewed. Preparation, sampling, and reduction stages are discussed; and examples of checklists, flight logs, and typical corrections are included. Redundancy is stressed as the key to a reliable data reduction system, with a hands-on approach to data reduction being necessary to ensure that the reduced data are meaningful. Altitude correction factors are illustrated for ozone, carbon monoxide, and nitrogen oxide measurements.

59739 **APTIC NO. 79726**

Anderson, Paul L.

FREE SILICA ANALYSIS OF ENVIRONMENTAL SAMPLES--A CRITICAL LITERATURE REVIEW. *Am. Ind. Hyg. Assoc. J., 36(10):767-778, Oct. 1975. 69 refs.*

The various analytical procedures for the analysis of free silica in environmental samples are reviewed. The methods include: solution chemical, X-ray diffraction, differential thermal (DTA), infrared spectroscopic, and some miscellaneous methods. The high solubility, amorphous surface layer problem is discussed. Individual problems with the various methods are discussed. Neither X-ray diffraction on DTA are acceptable. The particle size distribution of the sample under analysis is an important variable. If the particle size distribution is especially fine, phosphoric acid dissolves some of the quartz, and lowers the responses of infrared spectroscopy, X-ray diffraction, and differential thermal analyses. The phosphoric acid spectrophotometric method has the most detailed literature of the chemical procedures and is generally accepted as the best chemical method.

59740 **APTIC NO. 84102**

Angere, J., A. Haag, and G. Lehnert

A NEW METHOD FOR SAMPLING AND SAMPLING APPLICATION IN THE ULTRA-TRACE ANALYSIS OF AIR BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY. *(Eine neue Methode zur Probennahme und Probenaufgabe beider mit Gaschromatographie/Massenspek trometrie durchgefuehrten Luftanalyse im Ultraspurenbereich). Text in German. Z. Klin. Chem. Klin. Biochem. (Munich), 13(4):129-131, April 1975. 6 refs.*

A new method for sampling of air with ultra trace-analysis by gas chromatography-mass spectrometry is described. This method has a possible application for determination of pollutants in occupational and environmental studies. In the Druckaufgabe- pressure application method, the air pollutants are first condensed by cooling in liquid nitrogen. The condensate expands by heating, into the chromatographic column and mass spectrometer. The chromatographs have sharp peaks and results are superior to those by the thermogradient method. The main gas components of the air, N2, oxygen, and carbon dioxide serve well as carrying gases.

59741 **APTIC NO. 82354**

Aoki, Fumio, Tadaharu Iwawase, Kazuya Fujisawa, Iwao Nishiyama, and Gen Mikasa

AIR POLLUTION ANALYZER CALIBRATION BY THE CAPILLARY TYPE FLOW RATE MIXING METHOD USING STANDARD GAS GENERATING SYSTEM. *(Mosaikan shiki ryuruyohi kongoho hyojyun gasu hassei sochi ni yoru taiki osen yo bunsekikei no kasei). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 56, 1975. (Presented at the Japan Society for Analytical Chemistry Lecture Meeting, 24th, Sapporo, Oct. 1-5, 1975.)*

A nitric oxide-nitrogen dioxide analyzer using the Saltzman method and a sulfur dioxide analyzer using a solution conductimetric method were calibrated with standard gases prepared by a capillary type flow rate mixing method, using a standard gas generating system. The NO2 standard gas was obtained by spontaneous oxidation of pure NO by pure oxygen; and NO and NO2 standard gases of the same concentrations could be obtained the same way. The standard gas was passed into the analyzer, and the value indicated by the analyzer was calibrated against the concentration of standard gas. The main factors affecting the accuracy of the analyzer were NO2 absorption efficiency (90-93%), NO oxidation tank efficiency (76-83%) and the accuracy of the flow meter. According to a procedure similar to the one described for the NO-NO2 analyzer, the standard gas was passed into two SO2 analyzers, and the indicated values were compared. Factors affecting the accuracy were similar to those for the NO-NO2 analyzer; however, the accuracy of the flow meter was the most important factor.

59742 **APTIC NO. 82961**

Araya, Kozo

AN EXPLANATION OF MOBILE SMOG CHAMBER. *(Idoyo smog chamber kaisetsu). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:60-81, Sept. 1975.*

A mobile smog analyzing unit for photochemical reaction tests is described. The structure of the unit, survey methods and analytic methods for measuring pollutants, and manual analytic measuring methods are discussed. The Environmental Agency of Japan spent $380,000 in 1971 to manufacture mobile smog analyzing units for on-site surveys of photochemical smog. The mobile unit consists of a vehicle with a smog chamber. A man-made photochemical reaction is produced by collecting atmospheric air in the chamber and exposing it to ultraviolet light. A second vehicle loaded with analyzers analyzes the test gas from the chamber, and contains instruments to measure meteorological factors. On-site surveys at 120 sites in the Tokyo Bay area and Osaka Bay area were conducted, and 4500 samples analyzed up to 1974.

59743 **APTIC NO. 80268**

Arledge, K. W., W. Carter, L. G. Hays, and S. E. Kerho

IN-STACK CONTINUOUS MONITORING OF EMISSIONS FROM STATIONARY SOURCES (FINAL REPORT). *KVB Engineering, Inc., Tustin, Calif., California Air Resources Board Contract ARB 3-733, Proj. ARB 3-419-23, Rept. ARB-R-3-733-75-32, 102p., Jan. 1975. 16 refs.*

NTIS: PB 239 693

The status of technology of continuous monitors for emissions from stationary sources in California was studied. About 700 sources were identified which had emissions of 100 tons/yr or more of nitrogen oxides, sulfur dioxide, carbon monoxide, particulates, or hydrocarbons, and which were suitable for installation of a continuous monitor. Questionnaires were sent to manufacturers of continuous monitor systems to obtain information on cost, accuracy, reliability, availability, and other criteria for evaluation of systems to measure and record emissions of specific pollutant combinations. A scheme for converting emission rates in concentration units to mass flow units was devised. Electronic data handling and storage costs were estimated to be about 25% of the basic monitor cost. Some typical installations are discussed, describing the major components of continuous monitor systems. A number of conclusions and recommendations regarding continuous monitoring systems and minimizing the problems associated with installation of large numbers of these devices are presented. (Author abstract modified)

59744 **APTIC NO. 84194**

Asakino, Kunihiko, Kazuyuki Aoki, Masanao Funajima, and Toshio Ohira

NATURE OF AEROSOLS, PART 2, RELATION OF ELECTRICAL CONDUCTIVITY AND GASEOUS POLLUTANTS. *(Earozoru no seijo, 2, denki dendodo tokusei to gasujo osen busshitsu no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):279, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 16.)*

Electrical conductivity was considered as a sulfuric acid mist index. The aerosol was collected on an impinger with a 1 mm diameter nozzle and washed with dilute hydrochloric acid every hr. The electrical conductivity was measured. Conductivity could be used as an index for the sulfuric acid mist, and it also showed good correlation with atmospheric sulfur dioxide levels. The electrical conductivity for the same SO2 level was higher in July. The correlation of the electrical conductivity with the aerosol particle number measured by an aerosol counter was poor; however, the correlation with the particle weight concentration measured by a scattering dust monitor was high. The observation of higher particle weight concentration coincided with the higher electrical conductivity observation. From this result, it was concluded that the sulfuric acid mist could be had larger than sub-micron particle sizes.

59745 **APTIC NO. 84115**

Becker, Karl-Heinz and Gerda-Hanne Comsa

DETERMINATION OF THE HYDROGEN SULFIDE CONCENTRATION IN AIR BY RESISTANCE MEASUREMENT ON THIN SILVER LAYERS. *(Bestimmung des Schwefelwasserstoffgehaltes in Luft durch Widerstandsmessungen an duennen Silberschichten). Text in German. Metalloberflaeche, 29(5):241-242, May 1975. 14 refs.*

The rate of change of resistance of a thin silver layer in an air-hydrogen sulfide mixture was measured at concentrations from a few ppb to a few ppm H2S, and this rate of resistance change was applied to the measurement of atmospheric H2S concentrations. The Ag was evaporated onto a glass substrate at room temperature and at a pressure of 10-7 torr. Evaporation was continued until resistance between two platinum contacts was approximately 50 ohm, after which nitrogen was admitted to the evaporation vessel and the Ag layer was stored in N2 until needed. In use, an air-H2S mixture passed in contact with the Ag layer, and the resistance was measured on a bridge. When the time rate of fractional resistance change, delta R/Ro delta t, was plotted against H2S concentration in ppb, a straight line was obtained, with a slope of 0.66 over a range of 3 orders of magnitude. The sensitivity of the Ag layer to sulfur dioxide was less than sensitivity to H2S by a factor of 200.

59746 **APTIC NO. 82465**

Beckett, S. T., A. P. Middleton, and J. Dodgson

THE USE OF INFRARED SPECTROPHOTOMETRY FOR THE ESTIMATION OF SMALL QUANTITIES OF SINGLE VARIETIES OF U.I.C.C. ASBESTOS. *Ann. Occupational Hyg., 18(4):313-320, 1975. 15 refs. (Presented at the International Conference on the Physics and Chemistry of Asbestos Minerals, 3rd, Quebec, Canada, Aug. 1975.)*

An infrared technique for measuring small quantities (down to less than 10 microgram) of single varieties of asbestos was developed. It is able to monitor airborne fiber concentrations and to estimate sub-milligram amounts of single varieties of U.I.C.C., amosite, crocidolite, and chrysotile used in animal inhalation experiments. The method is simple to perform and requires minimal labor. Its precision for estimating microquantities of abestos (less than 200 microgram) is much greater than by direct weighing. (Author abstract modified)

59747 **APTIC NO. 80355**

Bell, David R., Kenneth D. Reiszner, and Philip W. West

A PERMEATION METHOD FOR THE DETERMINATION OF AVERAGE CONCENTRATIONS OF CARBON MONOXIDE IN THE ATMOSPHERE. *Anal. Chim. Acta, vol. 77:245-254, July 1975. 11 refs.*

A simple, inexpensive and reliable method for the determination of average concentrations of carbon monoxide in the atmosphere is described. Silver p-sulfamoylbenzoic acid is used as the colorimetric reagent in a specially designed permeation device. The calibration graphs are linear up to 80 ppm CO, and the limit of detection is 2 ppm for a 24-hour exposure. The method is not suitable for stack gas analysis where extreme temperature variations and high interferent concentrations may be present. It is not suitable for process stream analysis where rapid measurement is required, and temperature variations may also affect results. (Author summary modified)

59748 **APTIC NO. 76104**

Benarie, Michel and Jean-Pierre Quetier

PARTICLE DETECTOR BY MECHANICAL IMPACT SENSING (FINAL REPORT). *Institut Nat l de Recherche Chimique Appliquee, Vert-le-Petit (France), Environmental Protection Agency Grant 802424, Program Element 1AA010, ROAP 26AAM-36, Rept. EPA-600/2-75-025, 76p., June 1975. 35 refs.*

NTIS: PB 247212/AS

The possibility of particulate detection by mechanical impact sensing was investigated. Particulate beams were obtained when the accelerating capillary was relatively long and the pressure within the vessel below 1 torr. Impact sensing under particulate beam conditions was proportional to the mass concentration and independent of the grain size and content. A marked grain size dependence, however, was observed for chamber pressures above 1 torr and with short nozzles. Impact sensing in the resonant mode was also mass proportional under particulate beam conditions. The sensitivity of resonant mode impact sensing was about 100 times greater than that for direct impact sensing. Particle detection by impact sensing appears to be a technically feasible idea, though cost considerations might limit the usefulness of the detector. (Author abstract modified)

59749 **APTIC NO. 83442**

Bennett, Roy L., Jack Wagman, and Kenneth T. Knapp

THE APPLICATION OF A MULTICHANNEL FIXED AND SEQUENTIAL SPECTROMETER SYSTEM TO THE ANALYSIS OF AIR POLLUTION PARTICULATE SAMPLES FROM SOURCE EMISSIONS AND AMBIENT AIR. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Environmental Research Center, 10p., 1975. 2 refs.*

A Siemens multichannel wavelength X-ray fluorescence spectrometer that is specially adapted to the needs of the Environmental Protection Agency for the rapid analysis of particulate samples is described. The system consists of 16 fixed-wavelength spectrometers which are optimized for 16 preselected elements and a computer operated scanning channel which is used to determine additional elements that might be desired on a given sample. A minicomputer operates the instrument and sample changer and also processes the data. The fixed monochromators in the spectrometer are capable of analyzing for chromium, lead, manganese, arsenic, mercury, bromine, phosphorus, silicon, cadmium, aluminum, sulfur, sodium, fluorine, magnesium, potassium, and chlorine. The detection limit for most elements is 30 nanograms/sq cm or less. The high resolution of the crystal spectrometers permits analyses of air pollution and source emission samples which contain several dozen elements over a wide range of concentrations. (Author abstract modified)

59750 **APTIC NO. 84004**

Berner, Axel

CASCADE IMPACTORS AS MEASURING UNITS. *(Kaskadenimpaktoren als Messgeraete). Text in German. Physikalisches Inst. der Universitaet Wien, Vienna (Austria), Aerosol Meas. Technol. Colloq., Aachen, West Germany, 1975, p. 138-160. 15 refs. (March 4, 1975.)*

In cascade impactors the action produced by the hydrodynamic pressure gradient on a solid plate with nozzle apertures is used to classify suspended particles by equivalent sizes. Friction, expressed by the Stokes equation, is the only force acting on particles in impactors. These dust counters run through several consecutive steps, whose separation curves split up when represented on the particle size distribution scale, which may show cumulative or differential distributions. Low-pressure impactors are suitable for classifying particles smaller than 0.5 micron, whereas virtual impactors divide the function of the stagnation plate at the various stages in a standard impactor. Instrumentally related errors include variation in flow rate, non-fixation of particles to the precipitation site, and particle losses on other internal surfaces of the impactor.

59751 **APTIC NO. 76095**

Birks, L. S. and J. V. Gilfrich

LOW COST COMPACT X-RAY FLUORESCENCE ANALYZER FOR ON-SITE MEASUREMENT OF TRACE ELEMENTS IN AIRBORNE PARTICULATE EMISSIONS (FINAL REPORT). *Naval Research Lab., Washington, D. C., Environmental Protection Agency Interagency Agreement EPA-IAG-D4-0344, Program Element 1AA010, ROAP 26AAN-012, Rept. EPA-600/4-75-002, 17p., July 1975. 12 refs.*

NTIS: AD A014582

A compact, low powered, relatively inexpensive, wavelength dispersion X-ray fluorescence analyzer for the detection of trace elements in airborne particulate matter is described. The analyzer has an X-ray tube power of 80 watts and is capable of measuring the elemental composition of particulate matter collected from emission sources or from ambient air samples within 100-second detection limits ranging from 0.1-1 microgram/sq cm for elements which can be analyzed in an air path instrument. The cost of the components used to fabricate the instrument is below $5000.

59752 **APTIC NO. 72763**

Black, Arthur W. and Wesley C. L. Hemeon

IDENTIFICATION OF INDUSTRIAL ODOR PROBLEMS. *Preprint, American Inst. of Chemical Engineers, New York, 16p., 1975. (Presented at the American Institute of Chemical Engineers National Meeting, 79th, Houston, Tex., March 16-20, 1975.)*

Methods and equipment used in the identification of industrial odor problems are discussed. The measurement of the odor content of an industrial air sample involves the preparation of a series of air dilutions of the original sample in an odormeter and the submission of these diluted streams to human subjects in a systematic sequence. The corresponding dilutions and numerical odor votes are analyzed to derive the dilution that corresponds to the human threshold. The odor intensity measurement must be accompanied by the corresponding air flow rate which permits calculation of the total rate of odor emission in order to evaluate the neighborhood significance of the odor. Odor emission rate is the product of the odor concentration and the air flow stream which carries the odor. Although the measurement of air flow in a channeled air stream such as a duct presents no problem, fugitive odor sources such as oil refineries, large chemical plants, and waste water ponds require the use of such sampling equipment as floating hoods, liquid displacement samplers, and drum-bag samplers.

59753 **APTIC NO. 82449**

Blumer, Nikolaus

DIRECT POTENTIOMETRIC TITRATION OF SULPHUR TRIOXIDE IN FUMING SULPHURIC ACID WITH DILUTED SULPHURIC ACID. *(Direkete potentiometrische Titration des Schwefeltrioxids in rauchender Schwefelsaeure mit verduennter Schwefelsaeure). Text in German. Fresenius Z. Anal. Chem., 276(3):193-195, 1975. 3 refs.*

A direct rapid and reproducible method for the potentiometric titration of sulfur trioxide in fuming sulfuric acid (oleum) is described. Instead of water, 20 M in dilute sulfuric acid corresponding to 80% sulfuric acid is used for titration, using an electrode system composed of a mercury electrode and a mercury(I) sulfate reference electrode filled with 80% sulfuric acid. The heat of hydration must be held under control by means of an ice bath and by variation of the speed of titration. The titration end point is always found in the same potential range, which permits the use of a simple pH-meter.

59754 **APTIC NO. 82334**

Bolser, Clark M.

GAS SAMPLER FOR COLLECTING AND MEASURING GASEOUS EMISSIONS FROM LUES. *(Assignee not given.) U. S. Pat. 3,903,745. 10p., Sept. 9, 1975. 3 refs. (Appl. April 22, 1974, 17 claims).*

A gas sampler for collecting and measuring gaseous emissions from flues, primarily nitrogen oxides, is described. Unlike other conventional samplers, this sampler is lightweight and compact, and can be easily transported and operated by one individual. The sampler consists of a conveniently integrated arrangement of components enabling rapid set up and dismantling of essential sampling apparatus, collection of gas samplers, and other data necessary to determine flue gas discharge. All necessary physical measurement of a gas sample are made at the sampling site. The samplers includes a system for accurately measuring both high and low velocity pressure differentials in a flue by which the velocity and the volumetric flow rate of flue gas discharge can be determined. A pivotal control panel is provided which can be operated in either a horizontal or vertical position and which allows easy access to and service of all components of this sampler.

59755 **APTIC NO. 83677**

Bourbon, P., M. Giroux, M. Julien, J. Alary, Lestrade, and R. Malbosc

CONTRIBUTION TO THE STUDY OF THE DETERMINATION OF MICROQUANTITIES OF SULFATES. APPLICATION TO ATMOSPHERIC SULFATES. *(Contribution a l etude du microdosage des sulfates-application aux sulfates atmospheriques). Text in French. Tribune CEBEDEAU (Centre Belge. Etude Doc. Eaux), 28(379-380):282-284, June-July 1975. 9 refs.*

Particulate sulfates and hydrogen sulfide were non-selectively determined in microquantities on the basis of the reduction of the sulfates to hydrogen sulfide. The aerosols were trapped on a fiberglass filter and analyzed at a sampling rate of 60-100 l/hr. Following a 3-hour reduction of 5 ml of reagent (2.5 g sodium hypophosphite in 25 ml freezing acetic acid, 100 ml hydriodic acid at 57%) to remove sulfur in the reagent, the samples were mixed with the reagent. A 3-hour reduction produced a quasi total reduction of sulfuric acid to H2S for 0-300 microgram SO4 in the sample. The H2S was measured as methylene blue at 670 nm on a calibration curve determined with a zinc sulfur/zinc acetate solution S. For concentrations between 0 and 50 microgram in the reactor, and with a colorimeter precision of + or - 0.3 microgram s, the method is satisfactory.

59756 **APTIC NO. 82456**

Brenner, E. S.

DETERMINING CERTAIN UNSATURATED HYDROCARBONS USED IN THE SYNTHESIS OF ETHYLENE-PROPYLENE RUBBERS IN THE AIR. *(Opredelenie v vozdukhe nekotorykh nepredel-nykh uglevodorodov, primenyaemykh pri sinteze etilen-propilenovykh kauchukov). Text in Russian. Gigiena i Sanit., no. 3:82-87, 1975. 4 refs.*

Methods for the determination of hydrocarbons and their mixtures as used for or emitted during the synthesis of ethylene-propylene rubbers are described. Ethylidene norbornene and vinylnorbornene are determined photometrically by sampling waste gases through glacial acetic acid in two series-connected absorbers at a rate of 0.5 liter/min, after which para-dimethylaminobenzaldehyde in sulfuric acid is added to obtain a colored product by condensation reaction. The sensitivity amounts to 1 microgram/4 ml of the solution for ethylidene norbornene, and to 5 microgram/4 ml for vinylnorbornene. To determine tetrahydroindene, air is sampled through concentrated sulfuric acid at a rate of 1 liter/min, and colorimetric determination is done after addition of distilled water and vanillin. The sensitivity amounts to 2.5 microgram/4.5 ml of the solution. Mixtures of ethylidene norbornene, vinylnorbornene, tetrahydroindene and dicyclopentadiene in the air are separated by thin-layer chromatographic method, using alumina imbibed with silver nitrate for adsorption, carbon tetrachloride as a solvent, and potassium permanganate solution for visualization. The sensitivity amounts to 1 microgram.

59757 **APTIC NO. 75973**

Brooks, E. F., C. A. Flegal, L. N. Harnett, M. A. Kolpin, D. J. Luciani, and R. L. Williams

CONTINUOUS MEASUREMENT OF GAS COMPOSITION FROM STATIONARY SOURCES (FINAL REPORT). *TRW Systems Group, Redondo Beach, Calif., Environmental Protectioon Agency Contract 68-02-0636, Program Element 1AB013, ROAP 21ACX-132, Rept. EPA-600/2-75-012, 125p., July 1975. 4 refs.*

NTIS: PB 245024/AS

Methods for the continuous measurement of gaseous emissions from rectangular ducts at stationary sources were evaluated. A computer program was used to assess stratification levels and to evaluate sampling techniques. Accurate monitoring appeared feasible using only one flow sensor and one sampling probe, even in the presence of significant velocity and compositional stratification; stratification levels, however, were too high for single point samples to be acceptable. Good accuracy was attained by taking a spatial concentration average. Flow proportional sampling was not required. Field demonstrations verified the acceptability of the proposed methodology. (Author abstract modified)

59758 **APTIC NO. 82620**

Bruckman, L., E. Hyne, and P. Norton

A LOW VOLUME PARTICULATE AMBIENT AIR SAMPLER. *Preprint, Ambient Measurements Committee and The Air Pollution Control Assoc., Pittsburgh, Pa., Louisiana Section, 18p., 1975. 11 refs. (Presented at the Measurement Accuracy as it Relates to Regulation Compliance Specialty Conference, New Orleans, La., Oct. 26-28, 1975.)*

A continuous 30-day low-volume sampler was developed and field tested. It is intended to overcome the uncertainties introduced by partial annual total suspended particulate (TSP) sampling using conventional 24-hour high samplers, reduce the cost, and improve the accuracy of both TSP analysis and its chemical characterization. The lo-vol, which is enclosed in a shelter similar to a hi-vol and uses the same glass fiber filter paper, operates at an air sampling flow rate of 4 cfm as compared to 40 to 60 cfm used by a standard hi-vol. Total suspended particulate data were collected continuously on a roof in Hartford, Connecticut for 6 mo using both a lo-vol and a hi-vol. Concentrations obtained using the lo-vol were, on the average, 5% higher than those produced by the hi-vol for comparable averaging periods. The apparent higher levels might be due to an improved filter collection efficiency obtained at the low flow rate used by the lo-vol. Therefore, the lo-vol appears to yield an accurate TSP sample for the averaging times investigated, 30, 60, and 90 days. One potential shortcoming of lo-vol is the apparent inability to determine compliance with the daily TSP air quality standard; however, the hi-vol, unless measurements are taken daily, has the same problem. One possible way to handle this problem is to develop intermediate-term TSP standards which are consistent with both the current daily and annual TSP standards; compliance with such standards could readily be determined with lo-vol measurements. (Author abstract modified)

59759 **APTIC NO. 80015**

Bruner, F. and E. Brancaleoni

THE VALUE OF MASS SPECTROMETRY IN POLLUTION ASSESSMENT. *(Importanza della spettrometria di massa nella valutazione dell inquinamento). Text in Italian. Chim. Ind. (Milan), 57(5):347- 353, May 1975. 12 refs.*

Mass spectrometry can quickly detect all inorganic substances in dust with the use of one instrument only. The data obtained are important in determining the origin of pollutants, and in interpreting possible interactions between adsorbed gaseous molecules, and transformations that organic and inorganic substances captured by the particles can undergo as the inorganic matrix changes and acts as a catalyst for certain reactions. Photoelectron spectrometry (ESCA) is a different technique from mass spectrometry; however, since a number of mass spectrometers have turned part of their activities over to the ESCA, the latter is used to analyze the oxidized state of light elements such as nitrogen, sulfur, and phosphorus. The combination of gas chromatography and mass spectrometry is the most efficient way of studying more than one substance present in a sample. It is possible to separate and identify the components of complex mixtures in a few hours with an almost perfect accuracy in quantitative and qualitative data. Such a system presents certain problems, such as the need to separate the transport gas from the sample at the column exit. The two sub-systems must be perfectly paired in order to obtain the reduction and sensitivity suitable to both instruments.

59760 **APTIC NO. 82118**

Burch, Darrell E. and John D. Pembrook

NON-DISPERSIVE MULTIPLE GAS ANALYZER. *(Philco-Ford Corp. (now Aeronutronic Ford Corp.), Blue Bell, Pa.) U. S. Pat. 3,916,195. 9p., Oct. 28, 1975. 2 refs. (Appl. June 17, 1974, 10 claims).*

A gas analyzer for measuring separately the quantities of two or more gas species present in a sample is described. The instrument is applied to the analysis of carbon monoxide and methane. The analyzer uses a rotating gas cell having a pair of chambers which are alternately inserted into a beam of radiant energy. At least one chamber contains a quantity of each of the gas species to be analyzed at suitable pressures. After passing through the rotating gas cell, the radiant energy is passed through the sample region and is then split into two or more beams by suitable optics. Each beam is passed through a band pass filter and sensed by a photodetector. There is a photodetector for each gas species to be measured and the associated filter is designed to have a bandpass that admits radiant energy over a spectral region where the gas species displays suitable absorption lines. The electrical output from each photodetector is analzyed electronically and related to the quantity of a particular gas species in the sample. (Author abstract modified)

59761 ***APTIC NO. 76410***

Burenko, T. S., M. I. Dement eva, and S. F. Yavorovskaya

GAS-CHROMATOGRAPHIC DETERMINATION OF CERTAIN AMIDES IN THE AIR. (Gazokhromatograficheskoe opredelenie nekotorykh amidov v vozdukhe). Text in Russian. Gigiena i Sanit., no. 6:46-47, 1975. 2 refs.

A gas-chromatographic method for the determination of dimethylformamide and dimethylacetamide in the air is described. The metallic communications of the gas chromatograph were replaced by glass or fluoropolymer to prevent interference, and a sample volume of 0.5 microliter was used for the analysis in the form of aqueous solution. Nitrogen was used as carrier gas, and flame-ionization detector was used. Acetic acid and dimethylamine did not interfere with the determination. The relative error of the determination amounted to 1.5% for dimethylformamide, and 25% for dimethylacetamide. The sensitivity of the method is 10-12 microgram/ml for dimethylacetamide, and 6 microgram/ml for dimethylformamide.

59762 **APTIC NO. 76627**

Burghardt, E. and R. Jeltes

GAS CHROMATOGRAPHIC DETERMINATION OF AROMATIC HYDROCARBONS IN AIR USING A SEMI-AUTOMATIC PRECONCENTRATION METHOD. *Atmos. Environ., 9(10):935-940, Oct. 1975. 19 refs.*

A practically useful and simple technique for sensitive and selective measurement of aromatic hydrocarbons in the air was developed. A gas chromatographic analysis is made using a semi-automatic preconcentration method. The usefulness of the technique is increased by combining it with measurement techniques for other components such as carbon 1-C5 hydrocarbons and carbon monoxide. In principle the method can also be applied for other organic pollutants such as halogenated hydrocarbons with the appropriate gas chromatographic techniques. The technique is applied to the analysis of exhaust emissions in the Netherlands and the results are compared with those of other countries. (Author abstract modified)

59763 **APTIC NO. 82309**

Busch, Francis R.

GAS CONDITIONING AND ANALYZING SYSTEM. *(General Electric Co., San Jose, Calif.) U. S. Pat. 3,890,100. 15p., June 17, 1975. 2 refs. (Appl. Sept. 28, 1973, 43 claims).*

A system for conditioning and analyzing off gases from nuclear reactors at power plants is described which reduces the time required for holding such potentially explosive gases and thus the possibility of hazard associated with prior art monitoring techniques. The system receives a sample of the gas in a conduit leading to a detection chamber which contains a liquid reservoir for conditioning the sample and a detection unit for gas analysis. Separate gas and liquid outlets from the detection chamber are provided with the gas outlet leading to a flame checking chamber for the release of the gas under liquid. Subsequently, the gas and liquid are passed out of the chamber into a conduit leading to a discharge point. The liquid outlet leads to a liquid level regulator chamber from which the liquid is discharged from the system. (Author abstract modified)

59764 **APTIC NO. 76273**

Byer, R. L.

REMOTE AIR POLLUTION MEASUREMENT. *Opt. Quantum Electron., 7(3):147-177, May 1975. 133 refs.*

The Raman method, the resonance and fluorescence backscatter method, long path absorption methods, and the differential absorption method are discussed and compared for air pollution measurement. The absorption methods offer the most sensitivity at the least required transmitted energy. Topographical absorption provides the advantage of a single ended measurement, and differential absorption offers the additional advantage of a fully depth resolved absorption measurement. Recent experimental results confirming the range and sensitivity of the methods are presented. Future widespread use of remote pollution monitoring will probably be limited to the infrared to interact with molecular spectral bands and to meet eye safety requirements. (Author abstract modified)

59765 **APTIC NO. 83353**

Campbell, Evan E., Bernard C. Eutsler, and Patricio E. Trujillo

ATMOSPHERIC MERCURY SAMPLING MATERIAL AND METHOD. *(Energy Research and Development Administration, Washington, D. C.) U. S. Pat. 3,888,124. 4p., June 10, 1975. 5 refs. (Appl. Aug. 7, 1973, 4 claims).*

Materials useful for sampling atmospheric metallic mercury vapor and a method for determining the amount of Hg adsorbed on such materials are described. The adsorbing media consists of silver metal coated on finely divided particulate siliceous substrates. Particularly useful is the calcined diatomaceous earth manufactured and sold under the tradename of Chromosorb P. The amount of Hg adsorbed on the silvered substrate is readily quantitatively determined by flameless atomic adsorption spectrophotometry. Heating the silvered substrate to 700 C volatilizes all adsorbed Hg and renders the substrate once again useful for Hg sampling. Other systems are incapable of absorbing low levels of Hg vapor. (Author abstract modified)

59766 **APTIC NO. 76319**

Carli, B., D. H. Martin, E. Puplett, and J. E. Harries

SIMULATING EXPERIMENTS FOR SPACELAB. *Nature (London), 257(5528):649, Oct. 23, 1975. 3 refs.*

An absolute spectrometric radiometer for the spectral range 3-40/cm, intended for use on Spacelab, was tested. Measurements of ozone and minor atmospheric constituents were made from a NASA CV990 aircraft. Emission spectra were compared to those from a black-body cavity for calibration. More than 100 interferograms were recorded. Previous experiments had shown the need for improved techniques that would give a resolution of at least 0.01/cm unapodised so that overlapping emission lines from different constituents can be resolved; an interferogram can be recorded in a few minutes, and measurements of emission can be given in absolute terms (making possible quantitative estimates of constituents). The changes in instrumentation required for these ends were the introduction of a fast data acquisition system, adoption of the polarized interferometric method to suppress the effects of signal fluctuations and allow continuous reference to a cooled black-body calibration source, and the incorporation of greatly improved germanium bolometric detectors. Results so far indicate that the new techniques were successful.

59767 **APTIC NO. 82169**

Chiba, Atsushi

MICRODETERMINATION OF CADMIUM, CALCIUM AND COPPER IN ATMOSPHERIC PARTICULATES BY A GLASS RING OVEN TECHNIQUE. *Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), 8(7):1193-1197, 1975. 19 refs.*

The general and semicircular glass ring oven technique was applied for separation, concentration, and determination of cadmium, calcium, and copper in atmospheric particulates. The particulates were collected with a membrane filter, which was then cut into small disks. Each disk was fixed with a drop of acetone on the middle of a filter paper with the sample-bearing surface down. Twelve microliter of a mixture of nitric and hydrochloric acid was dropped on the disk to dissolve the sample. This filter paper was divided into four parts after the formation of sulfide on the disk by passing hydrogen sulfide. One part was fixed upon the semicircular glass ring oven. Calcium was developed with 0.05 normal hydrochloric acid. One part was exposed to bromine and ammonia fume in the case for cadmium and copper. These metals were developed in an arc form with 5 and then 5 microliter of 0.028% ammonia water. The color-producing reagents used were 2.0 wt% sodium hydroxide-0.2 wt% glyoxal-bis(2-hydroxyanil) ethanol solution for cadmium and calcium, and bathocuproine for copper. Calcium could be directly determined without influence by other metals. As an excess of copper interfered with the determination of cadmium, the standard addition method was applied to minimize the influence of copper. Use of a microscope, magnifying 50 to 100 times, improved precision. Detection limits for cadmium and calcium were 0.005 microgram. It took about 40 min to complete the determination of these metals. The precision was satisfactory, the relative standard deviation being 5% for these metals. (Author abstract modified)

59768 **APTIC NO. 82730**

Chuan, R. L.

RAPID ASSESSMENT OF PARTICULATE MASS CONCENTRATION IN THE ATMOSPHERE WITH A PIEZOELECTRIC INSTRUMENT. *Preprint, Instrument Society of America, Pittsburgh, Pa., 15p., 1975. 1 ref. (Presented at the Instrument Society of America Annual Meeting, Milwaukee, Wis., Oct. 1975.)*

The use of a piezoelectric crystal as the active element in an inertial impaction type of gravimetric particulate mass sampling system is discussed. Particulate matter deposited on the crystal is weighed continuously, thereby providing mass concentration measurement continuously and in real-time. The sensitivity of the quartz crystal is related basically to its thickness or its resonant frequency. Present circuitry in crystal monitors allows for the measurement of particulate mass concentrations down to 3 microgram/cu m. Interferences due to changes in the temperature of the sampled air can be avoided by designing the time constant of the instrument s electronics to be comparable to the typical time constant of the temperature fluctuation in the atmosphere. Errors due to water vapor adsorption and desorption are avoided by using a non-hygroscopic and non-reactive adhesive coating on the electrodes. Examples of particulate mass concentration measurements for temporally and spatially varying situations are presented.

59769 **APTIC NO. 79827**

Clymer, A. Ben and John C. Burr

MODELING AND OTHER CALCULATIONS IN THE DESIGN OF URBAN AIR MONITORING NETWORKS. *Preprint, Ohio Environmental Protection Agency, 25p., 1975. 20 refs. (Presented at the Air Pollution Control Association East Central Section Meeting, Dayton, Ohio, Sept. 17-19, 1975.)*

The functions of air monitoring networks include detection of incipient pollution episodes, determination of the annual average concentration of pollutants in densely populated areas, and determination of compliance with regulations. The episode network designed for the first purpose may differ somewhat from the ambient network designed for the second and third purposes. The design of both types of networks is discussed. The ambient network is designed to contain sulfur dioxide and suspended particulate sensors. The number of ambient sensors needed is considered. A model is presented which is intended for hand calculation of total suspended particulates or SO2 annual average concentration, or its square, averaged also over an annular area around a point source. Multiple and nonpoint sources are also considered.

59770 **APTIC NO. 76073**

Constant, Paul C., Jr., Michael C. Sharp, and George W. Scheil

COLLABORATIVE TEST OF THE CHEMILUMINESCENT METHOD FOR MEASUREMENT OF NO2 IN AMBIENT AIR. *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1363, Program Element 1HA327, ROAP 26AAF, Rept. EPA-650/4-75-013, 135p., Feb. 1975. 9 refs.*

NTIS: PB 246843/AS

A collaborative test of the Tentative Method for the Continuous Measurement of Nitrogen Dioxide in the Atmosphere (Chemiluminescent Procedure) was performed by 10 organizations to determine the precision and bias of the method. The method was adequately written for individuals knowledgeable in sampling and analytical techniques. An average bias of -8 micrograms cu m over the range of 80-300 micrograms/cu m can be expected. The within-laboratory standard deviation is 6%, and the collaborator standard deviation is 14%. These components are dependent, however, on the NO2 level. (Author conclusions modified)

59771 **APTIC NO. 80145**

Cooper, Douglas W.

STATISTICAL ERRORS IN BETA ABSORPTION MEASUREMENTS OF PARTICULATE MASS CONCENTRATION. *J. Air Pollution Control Assoc., 25(11):1154-1155, Nov. 1975. 5 refs.*

Statistical errors in beta absorption measurements of particulate mass concentration are determined. The error due to uncertainty in both initial and final counts is measured. As instruments are developed to measure over smaller mass concentrations, the initial counts and final counts are becoming progressively closer in magnitude and the errors in both should be considered. The analysis is not limited to the beta absorption context but is applicable to other penetration or transmission mechanisms.

59772 **APTIC NO. 84321**

Cunningham, J. E., W. F. Harris, J. W. Key, and C. D. Wolbach

ESTIMATION OF POINT SOURCE EMISSION STRENGTHS WITH AIRCRAFT. *Preprint, Texas Air Control Board, Austin, Tex., 4p., 1975. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

The estimation of point source emission strengths using aircraft for pollutant sampling is discussed. Parameters needed for the calculation of emission source strength include: pollutant concentration, plume horizontal and vertical distance measurements, wind speed, the molecular weight for gaseous pollutants, ambient temperature, and ambient pressure. In practice, the plume width is determined as the product of chart speed and the linear measurement of peak width for a recorded peak chosen as being the centerline of the plume. Aerial sampling operations for sulfur dioxide at sources whose average emissions ranged from 400-24,000 lb/hr are described. The standard deviations of the results ranged from 2-6% of the average emissions for the samples collected. Sulfur dioxide emission factors obtained by aerial samples and by stack sampling at a given location are reported and show good agreement.

59773 **APTIC NO. 81749**

Daidoji, Hidehiro and Masahira Tamura

NOX SPECTRUM MEASUREMENT IN ULTRAVIOLET AND VISIBLE REGIONS BY ELECTRODELESS DISCHARGE TUBE WHICH IS MANUFACTURED FOR TRIAL. *(Shisaku mudenkyoku hodenkan ni yoru shigai, kashiryoiki no NOx supekutoru no sokutei). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 158, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper 2C10.)*

The nitric oxide molecular spectra in the 1900 to 3000 A region were examined using an electrodeless discharge lamp. The feasibility of using this spectral region for nitrogen oxides analysis was studied. The spectral peaks were observed at

1945, 2048, 2149, 2263, 2586, 2713, and 2850 A, the NO transitions of which could be assigned. These peaks agreed with the NO spectra obtained by the flame emission method.

59774 **APTIC NO. 80143**

De Wiest, F. and H. Della Fiorentina

SUGGESTIONS FOR A REALISTIC DEFINITION OF AN AIR QUALITY INDEX RELATIVE TO HYDROCARBONACEOUS MATTER ASSOCIATED WITH AIRBORNE PARTICLES. *Atmos. Environ., 9(10):951-954, Oct. 1975. 4 refs.*

Particulate matter was sampled on glass fiber filters located on a roof top in Liege, France during Dec. 1974-March 1975. The sampling site is located northeast of highly populated urban areas and is strongly affected by industrial emissions. Aerosols collected with west-southwest-south winds have a particulate component with a large and freshly emitted volatile hydrocarbon fraction (transportation, combustion of coal and oil, industrial emissions). The relative effect of sampling rates on composition of organic extracts is particularly important. Aerosols coming from northwest-north-east-southwest are aged aerosols emitted from distant sources. During transport (several hours or days) the more labile hydrocarbon fraction is progressively released from particles by aerodynamic elution.

59775 **APTIC NO. 82855**

Delew, Richard Brandt

FLAME PHOTOMETRIC DETECTOR EMPLOYING PREMIXED HYDROGEN AND OXYGEN GASES. *(Varian Assoc., Palo Alto, Calif.) U. S. Pat. 3,879,126. 4p., April 22, 1975. 9 refs. (Appl. Aug. 20, 1973, 6 claims).*

A novel flame photometric detector is described wherein the hydrogen fuel gas and the combustion supporting gas are premixed and then delivered to the burner tip via one passageway to produce the desired reducing flame at the top. The sample is delivered to the peripheral region of the flame via a separate passageway such that contact of the sample and the flame occurs in the outer portion of the flame. The flame is considerably more reliable than in other systems, and is not snuffed out with surges of solvent through the sample conduit. The flame continues even when the gas chromatograph column is removed. As a consequence of this premixing there is no free flowing hydrogen to escape. (Author abstract modified)

59776 **APTIC NO. 81084**

Della Fiorentina, H., F. De Wiest, and J. De Graeve

INFRARED SPECTROMETRIC DETERMINATION OF THE CONTENT OF NON VOLATILE ORGANIC MATTER ASSOCIATED WITH AIRBORNE PARTICULATES. I. CHOICE OF OPERATION CONDITIONS. II. FACTORS AFFECTING THE ALIPHATIC INDEX. *(Determination par spectrometrie infrarouge de la matiere organique non volatile associe aux particules en suspension dans l air -- II. Facteurs influencant l indice aliphatique). Atmos. Environ., vol. 9:517-522, 1975. 7 refs. Translated from French, 9p.*

Seven atmospheric samples were collected simultaneously during 24 hr at different speeds from 8 to 100 cm/sec. Sampling carried out at different speeds greater than 50 cm/sec led to practically the same infrared absorption signal within 10 or 15%. The imposed aerodynamic conditions were sufficinetly drastic to eliminate the most unstable fraction of the atmospheric hydrocarbons. The gaseous flux for speeds less than 50 cm/sec exerted an eluant action too weak to totally eliminate the most volatile portion, whose contribution to the infrared and weight measurements can fluctuate in an uncontrollable and irreproducible manner from one sample to another. Using apparatus operating at different speeds, four series of independent samplings were carried out with sampling times of 8, 16, 24, and 64 hr. The composition of organic aliphatic material adsorbed on suspended matter varied with the duration of sampling as well as the flow rate: most compounds with boiling temperatures lower than 300 C were progressively eliminated from the sample. If sampling lasted 24 hr or more, the composition of the sample was stabilized and standardization of the spectrophotometer response against a weighed amount of extract was satisfactory, the nature of the remaining heavy aliphatic substances showing little variability for different places and periods of the year. (Author abstract modified)

59777 **APTIC NO. 82907**

Della Fiorentina, H., J. De Graeve, and F. De Wiest

INFRARED SPECTROMETRIC DETERMINATION OF NON-VOLATILE ORGANIC MATTER ADSORBED ON AIRBORNE PARTICLES. PART I-SELECTION OF THE OPERATING CONDITIONS. *(Determination par spectrometrie infrarouge de la matiere organique non volatile associee aux particules en suspension dans l air -I. Choix des conditions operatoires). Text in French. Atmos. Environ., 9(5):513-516, May 1975.*

An infrared spectrometric method of determining non-volatile organic matter adsorbed on airborne particles is described. The sample is extracted with carbon tetrachloride, and the infrared spectrum of the organic material is registered from 3100 to 2800/cm. The sum of absorbances, measured at 2870, 2925, and 2960/cm, is plotted on a predetermined calibration curve. The volume of the extract can vary from 3 cu cm (the minimum volume necessary to fill the container) to 25 cu cm (the minimum volume necessary for the daily extraction of a sample). For concentrations over 0.02 mg/cu cm, the precision is excellent. The variation coefficient is about 4%.

59778 **APTIC NO. 83310**

Descamps, Freddy Francois Eugene, George Luciaan Dumont, and Walter Remi Adele Goossens

FLUIDIZATION COLUMN. *(Studiecentrum Voor Kernenergie SCK, Brussels (Belgium)) U. S. Pat. 3,887,337. 7p., June 3, 1975. 3 refs. (Appl. Aug. 21, 1972 1 claim).*

A fluidization column with an auxiliary gas lift mixing device to promote uniformity in a fluidized bed of particles with a range of particle density or particle size is described. The gas lift consists of a riser pipe and a bell inside which opens a duct for supplying from the outside the column, variable gas feed to the riser pipe. The bell is arranged in the fluidized bed with the lower side of the bell about 1 cm above the column sieve plan plate. The bell is open on the lower side, and the bell s upper side is connected to the lower end of the riser pipe. In comparison to other systems, the bed of this column is steady and the fluidization gas consumption does not have to be increased to separate the powder-like material components. (Author abstract modified)

59779 **APTIC NO. 81828**

Dietz, Russell N. and James D. Smith

FABRICATION OF PERMEATION AND DIFFUSION DEVICES. *Am. Chem. Soc. Div. Environ. Chem. Prepr., 15(2):40-43, 1975. 4 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 170th, Chicago, Ill., Aug. 24-29, 1975.)*

Permeation and diffusion devices which are capable of providing ppb concentrations of many condensible gases for standard reference use and which can be calibrated in a matter of hours are described. A permeating water device which uses a 1/8-inch compression tee can be calibrated in about 3 hr at a flow rate of 20 nl/min. All welded parts are helium leak-checked, and the entire assembly is leak-checked with sulfur hexafluoride after the installation of the Teflon wafer. Diffusion devices using wafers cut from porous glass in place of Teflon can be made in similar fashion to the permeation device. Calibration data for nitrogen dioxide, ammonia, and carbon monoxide are presented.

59780 **APTIC NO. 83038**

Dietz, Russell N. and James D. Smith

CALIBRATION OF PERMEATION AND DIFFUSION DEVICES BY AN ABSOLUTE PRESSURE METHOD. *Preprint, American Society for Testing and Materials, Philadelphia, Pa., 35p., 1975. 11 refs. (Presented at the American Society for Testing and Materials Symposium on Calibration, Boulder, Colo., Aug. 5-7, 1975.)*

An absolute pressure method for the calibration of permeation and diffusion devices is described. The procedure involves combining high resolution pressure and temperature measuring instruments with newly designed premeation wafer devices and can be performed in less than 1/100 the time required for conventional gravimetric procedures. Using low and ultra low rate calibrated permeation devices, the inaccuracies and expense associated with the use of exponential dilution flasks and large quantities of diluent gas for providing part-per-billion calibration gases are markedly reduced. Controlled flow rates of non-condensible gases such as carbon monoxide and methane can be provided at microliter-per-minute rates using porous glass diffusion devices. Gravimetric and absolute pressure calibration data are compared for both hydrogen sulfide and sulfur dioxide.

59781 **APTIC NO. 82294**

DiNardi, Salvatore R. and Elaine S. Briggs

HYDROCARBONS IN AMBIENT AIR. A LABORATORY EXPERIMENT. *J. Chem Educ., 52(12):811-812, Dec. 1965. 11 refs.*

A laboratory experiment for the determination of hydrocarbons i ambient air is described. Samples were taken along road sides during hours of peak traffic flow as well as from quiet rural areas. A variation from barely detectable to 7.2 ppm of non-methane hydrocarbons was observed. The levels of non-methane hydrocarbons within an indoor parking garage varied from 1.2-25.7 ppm. Analysis consists of running a sample through a gas chromatograph, which yields the total hydrocarbons in the sample. A drying tube is inserted between the bag and the sampling valve. The silica gel in the tube retains all the non-methane hydrocarbons in the sample and the peak produced is due to methane type hydrocarbons only. This peak is subtracted from the total hydrocarbon peak to find the concentration of total non-methane hydrocarbons in the sample.

59782 **APTIC NO. 76631**

Dmitriev, M. T. and L. D. Pribytkov

GAS-CHROMATOGRAPHIC DETERMINATION OF OXYGEN-CONTAINING ORGANIC COMPOUNDS IN THE AIR. *(Gazokhromatograficheskoe opredelenie kislorodsoderzhashchikh organicheskikh soedineniy v atmosfernom fozdukhe). Text in Russian. Gigiena i Sanit., no. 2:67-71, 1975. 5 refs.*

A method for the sampling and gas-chromatographic determination of butyl aldehyde, acetone, isobutyl alcohol, n-butyl alcohol, and other alcohols in the air in the presence of aromatic hydrocarbons and paraffins with 1 to 8 carbon atoms without cooling is described. An air sample of 3-4 liter is passed through a concentrating tube with 1,2,3-tris-(beta-cyanoethoxy) propane over 10 min at ambient temperature at a rate of 0.5 m/sec, after which the adsorbed sample is expelled from the tube into the gas-chromatographic column containing detergent OP-7 in one section, and 1,2,3-tris-(beta-cyanoethoxy) propane in another. The sensitivity of the method amounts to 0.04 mg/cu m for butyl aldehyde, and 0.01 mg/cu m for butyl and other alcohols. The aromatic hydrocarbons and paraffins do not interfere with the determination.

59783 **APTIC NO. 83376**

Dmitriev, M. T., V. V. Osechkin, and L. D. Pribytkov

AUTOMATIC PORTABLE OZONE ANALYZER FOR ATMOSPHERIC AIR. *(Portativnyy avtomaticheskiy analizator ozone v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no 3:46-49, 1975. 2 refs.*

A portable automatic analyzer for atmospheric ozone is described. The analyzer is composed of an ozone-sensitive chemiluminophor layer composed of rhodamine C with gum arabic in silica gel ASM applied on a glass plate, an electron multiplier, videoamplifier, and a counter. The mean frequency of the flashes is proportional to the ozone concentration. The chemiluminescent method is specific for ozone. The errors caused by hydrogen peroxide, formaldehyde, nitrogen dioxide, nitric oxide, sulfur dioxide and acrolein amount to 1.2%, 0.08%, 0.12%, 0.05%, 0.03% and 0.02%, respectively.

59784 **APTIC NO. 76386**

Doerre, W. H.

A NEW STATISTICAL MODEL FOR DESCRIBING THE TIME BEHAVIOR OF AIR POLLUTION CONCENTRATIONS, ESPECIALLY OF THE DUSTY COMPONENT. *(Ein neues statistisches Modell zur Beschreibung des zeitlichen Verlaufs der Konzentration von Luftverunreinigungen, speziell der staubfoermigen Komponente). Text in German. Z. ges. Hyg. Ihre Grenzgebiete (Berlin), 21(9):673-683, 1975. 10 refs.*

A statistical model that takes into account the correlation of consecutive values of pollutant concentration, assuming in some cases a logarithmically normal frequency distribution, is described. The approximation equation derived is valid for any given frequency distribution and describes the correlation between the deviations in the concentration values at various mean values with respect to time. With a logarithmically normal frequency distribution, the model allows determination of the frequency and duration of occasions when concentrations exceed threshold values, as well as the frequency distribution of changes in concentration/unit time, and the prevailing maximum concentration. The empirical constants required for calculation, in addition to mean value and deviation, are given.

59785 **APTIC NO. 82507**

Dreyer, Juergen

TURBIDIMETRIC GRAIN SIZE ANALYSES OF DISPERSE DIELECTRIC SYSTEMS AT THE APPLICATION OF A DISTRIBUTION FUNCTION WITH THREE PARAMETERS. *(Turbidimetrische Korngroessenanalyse disperser dielektrischer Systeme bei Verwendung einer dreiparametrigen Verteilungsfunktion). Text in German. Freiberger Forschungsh. A, vol. 531:51-64, 1975. 5 refs.*

Turbidimetric grain size analysis of disperse dielectric systems by the use of a distribution function with three parameters is described with respect to powders of glass, cement, gypsum, titania, clay quartz glass, and polystyrene latex. Compared with grain size distribution functions with two parameters, the distribution function with three parameters yields significantly more accurate results. The differences between the distribution functions with two parameters were not significant.

59786 **APTIC NO. 83617**

Drozd, Josef

CHEMICAL DERIVATIZATION IN GAS CHROMATOGRAPHY. *J. Chromatog., 113(3):303-356, Oct. 22, 1975. 604 refs.*

The use of chemical derivatives in gas chromatographic analysis is reviewed. Derivatization is used to increase the volatility of substances with boiling points that are too high, to reduce the adsorption of solutes on the support and column surface, and to improve the separation. Special derivatives provide for the selective detection of certain species of compounds or the separation of chemically very similar compounds, such as optical isomers. The derivatives include: esters, ethers, silyl derivatives, acyl derivatives, oximes and hydrazones, and chelates of metals. Specific methods for the analysis of the following groups of compounds are presented: alcohols and phenols; aldehydes and ketones; amines; sulfur compounds; carboxylic acids; amino acids; thyroid hormones; steroids;

saccharides and related compounds; bases of nuclei acids, nucleosides, and nucleotides; insecticides and other pesticides; pharmaceuticals and drugs; and anions of inorganic acids and related compounds.

59787 **APTIC NO. 84201**

Dutkiewicz, Jacek and Czeslaw Kwapiszewski

NEW APPARATUS FOR THE DETERMINATION OF MICROBIAL AIR POLLUTION. *(Nowy aparat do badania mikrobiologicznego zanieczyszczenia powietrza). Text in Polish. Ochrona Powietrza (Warsaw), 2(46):37-42, March-April 1975. 16 refs.*

A new instrument for the examination of microbial atmospheric pollution is described. It permits air sampling under all ground conditions and the determination of the total of microorganisms/unit volume of air, the magnitude of the respirable fraction of microorganic aerosol likely to penetrate human alveoles, and the composition of aerial microflora. The device works on the impaction principle. A predetermined volume of the air is drawn by means of a pump through a narrow slit or aperture in a hermetic chamber to a plate covered with agar. Tiny particles from the high-speed air stream impinge on the agar and adhere to it. After incubation and counting of the number of the microorganic colonies, the number of variable particles in 1 cu m of air is calculated by a simple formula. The instrument permits simultaneous withdrawal of 2 air samples through 2 suction nozzles and their direction to agar plates in separate chambers. A selective mechanism on the second nozzle makes it possible to catch coarse-grained particles leading to the collection of the respirable fraction on the agar. In order to work in the field, the apparatus is equipped with an accumulator supplying direct current to attached electrical devices. The instrument might also be applied to the determination of chemical and mechanical pollutants by a simple exchange of the inlet nozzles. Replacement of some of its metal parts by plastic ones could reduce its weight. Transportation might be facilitated by placing it on a hand cart.

59788 **APTIC NO. 82748**

Eckert, J. A., J. L. McElroy, D. H. Bundy, J. L. Guagliardo, and S. H. Melfi

DOWNLOOKING AIRBORNE LIDAR STUDIES - AUGUST 1974. *Preprint, Environmental Protection Agency, Las Vegas, Nev., Environmental Monitoring and Support Lab., 4p., 1975. 3 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Airborne lidar studies were conducted over St. Louis, Missouri during August 1974 to determine the height of the mixed layer over the metropolitan area. Emphasis was placed on obtaining data during the morning and evening transition periods. Instrumentation for the monitoring technique consisted of a downlooking lidar mounted in a fixed-wing aircraft with onboard data capability. Final data reduction was by ground-based digital computer. A strong correlation between vertical profile nephelometer data obtained from helicopter ascents and aerosol scattering as recorded by the downlooking lidar was obtained. Mixed layer height was determined by observing the lidar returns from aerosols trapped at the inversion interface. The monitoring technique demonstrated potential for the following applications: the investigation of the fine structure of the atmospheric boundary layer, the establishment of optimal locations for ground-based sensors used for determining the mixing layer height, the assessment of urban plume dimensions, and the procurement of data on the aerosol distribution in individual plumes.

59789 **APTIC NO. 80103**

Egan, Harold

CHEMICAL ANALYSIS AND ENVIRONMENTAL QUALITY. *Chem. Ind. (London), no. 19:814-820, Oct. 4, 1975. 44 refs.*

The chemical analysis of the atmospheric environment is discussed. Field tests are available for specific industrial hazards designed to indicate levels of exposure approaching the threshold limit value. The threshold limit value in industrial situations for sulfur dioxide is 5 ppm by volume. Total sulfate is determined by the sensitive tetrachloromercurate method used for short period sampling. Rugged portable electro optic devices based on ultraviolet absorption are available for SO2 estimations. Particulate material is collected in a standard deposit gauge. Separate measurements of combustible matter, ash, tar, and dissolved ions are made. Smoke is assessed as units of equivalent standard smoke using a reflectometer to measure the darkness of a stain collected on a filter. Other standard methods are available for the measurement of sulfuric acid, total sulfate, ammonium salts, sodium chloride, polycyclic aromatic hydrocarbons, trace metals, total fluoride, hydrogen sulfide, ammonia, nitrogen oxides, carbon monoxide, ozone, and methane.

59790 **APTIC NO. 80149**

Egan, Harold

AN ANALYST IN THE ENVIRONMENT: IS NANOCHEMISTRY NECESSARY? *Chem. Can., 27(11):18-20, Dec. 1975. 7 refs. (Presented in the Chemical Conference, 58th, Toronto, Ontario, May 25-28, 1975.)*

The significance of trace analysis in measuring environmental quality is discussed. There is a vast increase in the number of different trace compounds which are theoretically possible to detect in the higher realms of analytical sensitivity. Various assumptions can be made as to the numerical distribution of trace contaminants as the limit of detection is extended downward. In gas chromatography, a range of detectors was developed for monitoring the column effluent and by choice of a suitable detector, concentrations of substances ranging from percentage amounts down to parts per thousand million or less can be estimated. The ability to detect concentrations of one part in 10 to the 9th power is not uncommon and such methods are of considerable use in measuring pollutants which are encountered at extremely low concentrations.

59791 **APTIC NO. 83807**

Eguchi, T.

NOX ANALYTICAL MEASURING DEVICE BY THE CHEMILUMINESCENCE METHOD. *(Kagaku hakkoho ni yoru NOx bunseki keisokuki (3)). Text in Japanese. Otomeshon (Automation), 20(9):29-33, Sept. 1975.*

Yanagimoto ECL model nitrogen oxides analyzers are described. The analyzers measure chemiluminescence at reduced pressure. Stainless steel tubes are used for standard sampling probes while PVC tubes are used for sampling low-temperature (below 60 C) waste gases. For high-temperature gases, quartz tubes or ceramics were used. The analytical system of an ECL analyzer consists of a reactor in which sample gas reacts with ozone, an ozone generator, a photoelectric detector, and flow regulators for sample gas and ozone. The pressure in the reacctor is usually reduced to 5-10 mm Hg and the sample gas is introduced at 10-20 ml/min. An ECL-300 model has seven measuring ranges from 0-10 ppm to 0-1000 ppm, while an ECL-16 model has four measuring ranges from 0-100 ppm to 0-1000 ppm. The interference of carbon dioxide could be reduced by increasing the flow rate of ozone. The ECL model has a zero drift of + or - 0.5%.

59792 **APTIC NO. 82972**

Eichmeier, Joseph

AIR POLLUTION MEASUREMENT EQUIPMENT. *(Constantin Graf Von Berckheim, Weinheim an der Bergstrasse (Federal Republic of Germany)) U. S. Pat. 3,889,180. 5p., June 10, 1975. 4 refs. (Appl. Dec. 12, 1973, 8 claims).*

Equipment for measuring air pollution is described. A stream of polluted air is forced between the plates of a first and second air capacitor. Voltage is applied for furnishing a first and second measurement signal varying, respectively, as a function of small and large positive ion concentration in the air. A divider circuit divides the second by the first measurement signal. The resultant first output signal is added to a second output signal similarly derived from the measurement of negative ions to furnish the final pollution measuring signal. (Author abstract modified)

59793 **APTIC NO. 80011**

Eysenbach, W., B. Suttkus and G. Heller

QUANTITATIVE DETERMINATION OF SULPHATE AND SULPHIDE (AFTER OXIDATION) BY MEANS OF THE ORION IONALIZERS. *(Quantitative Bestimmung von Sulfat und Sulfid (nach Oxydation) mit Hilfe des Orion-Ionalizers). Text in German. Fresenius Z. Anal. Chem., 277(3):183-187, 1975. 4 refs.*

A potentiometric procedure for the determination of sulfate has been tested. The analysis requires about 10 to 15 minutes. The determination of the end point is free from individual influences. In the measurement of 0.1 N sodium sulfate, the average error of the single measurement was fm equals + or - 7%. A more detailed complexometric method yielded an average error of fm equals + or - 2%. The method was applied to the determination of sulfate from sulfide (after oxidation of the latter). No considerable deviation from the gravimetrically ascertained values was noted. Borate does not interfere. (Author abstract)

59794 **APTIC NO. 76320**

Filby, W. G., K. Guenther, and R. D. Penzhorn

RELATIVE MOLAR RESPONSE OF A FLAME IONIZATION DETECTOR TO SOME ORGANIC COMPOUNDS CONTAINING SULFUR. *Anal. Chem., 47(13):2283-2285, Nov. 1975. 13 refs.*

The relative molar response (RMR) of a flame ionization detector to 13 organic compounds containing sulfur was determined. With the sole exception of compounds containing quaternary carbon, the RMR values are, within groups of compounds of similar structure, roughly proportional to the number of available carbons in the molecule. The incorporation of sulfur has little effect on the RMR when they are situated between two non-effective carbon atoms. The degree of oxidation of a sulfur atom in a S-oxygen containing hydrocarbon has only a minor effect on the RMR.

59795 **APTIC NO. 79728**

Findlay, W. J., G. Dowd, and N. Quickert

DETAILED EVALUATION OF THREE CHEMILUMINESCENT OZONE MONITORS. *Sci. Total Environ., 4(2):135-154, July 1975. 7 refs.*

Three gas phase chemiluminescent ozone analyzers were evaluated and the characteristic of the gas flow systems were studied. There are significant differences in certain areas. The instrument response was measured as a function of sample and ethylene flow rates and the dependences are different for each monitor. Errors introduced by using particulate filters on the input stream were investigated. Response times were measured and compared with those given by the manfuacturers. An analysis of the output signals was performed using a standard strip chart recorder and a storage oscilloscope. Operating characteristics are compared over an extended period. The instruments sampled ambient air for 1 mo and flow rate changes and zero and span drifts are noted. Measurements data from each monitor are compared and correlation coefficients calculated. The correlation between each pair is better than 0.97. (Author abstract modified)

59796 **APTIC NO. 82731**

Findlay, W. J., G. Dowd, and N. Quickert

EVALUATION OF CHEMILUMINESCENT OXIDES OF NITROGEN MONITORS. *Preprint, Environmental Protection Service, Ottawa (Ontario), Chemistry Div., 10p., 1975. 3 refs.*

An evaluation of five chemiluminescent nitric oxide/nitrogen oxide monitors, three of the cyclical type and two of the dual detection chamber type, is presented. Nitrogen dioxide minimum detectability is difficult to determine for the cyclical type instruments which are not capable of giving actual concentration-time profiles and the magnitudes of peak concentrations. In situations where NO and NO2 concentrations vary continually with time and where peak concentrations last less than a minute, cyclical instruments result in a loss of time resolution and can give negative and incorrect maximum concentrations. Dual detection chamber monitors thus possess definite advantages over cyclical type instruments, although there is some loss of information with the former type for low concentrations and large time constants.

59797 **APTIC NO. 82043**

Fluckiger, Rudolf

SEPARATOR FOR SEPARATING GASES OF DIFFERENT MOLECULAR WEIGHT AND CHROMATOGRAPHY ARRANGEMENT. *(Balzers Patent-und Beteiligungs-Aktiengesellschaft, Liechtenstein (Switzerland)) U. S. Pat. 3,912,470. 6p., Oct. 14, 1975. (Appl. June 24, 1974, 6 claims).*

A device for separating gases of different molecular weight, particularly for the parital separation of the carrier gas from the gas to be analyzed in gas chromatographic procedures, is described that permits the control of the stream of useful gas without the use of a mechanical shut-off element in the separator chamber. The apparatus consists of a separating chamber which can be evacuated, an inlet opening for the gases, and outlet opening facing the inlet opening, and a device for controlling the stream of useful gas evacuated through the outlet opening. An additional inlet opening to accommodate an auxiliary gas stream is arranged relative to the first inlet opening such that the two gas streams produced in the evacuated chamber intersect each other. (Author summary modified)

59798 **APTIC NO. 76002**

Fontijn, Arthur, Herman N. Volltrauer, and Roy Ellison

A CHEMILUMINESCENCE REACTIVE HYDROCARBON ANALYZER FOR MOBILE SOURCES (FINAL REPORT). *AeroChem Research Labs., Inc., Princeton, N. J., Environmental Protection Agency Contract 68-02-1224, Program Element 1A1010, ROAP 26ACV, Rept. EPA-650/2-75-069, TP-319a, 82p., June 1975. 33 refs.*

NTIS: PB 245126/AS

A chemiluminescence method for measuring the total reactivity of hydrocarbon mixtures is described along with the design of a prototype analyzer. The method is based on the difference between the hydroxyl radical emission intensities at 308.9 and 312.2 nm during oxygen atom-hydrocarbon reactions near 1 torr pressure. The emission intensity at 308.9 nm is much greater than that at 312.2 nm for ethylene, whereas the emission intensities at both wavelengths are about the same for acetylene. Methane yields no emission. The relative response to individual reactive hydrocarbon species can be set to give good agreement with reactivity ratings. The response to hydrocarbon mixtures is additive. The limit of sensitivity is about 0.05 ppm ethylene equivalent, although greater sensitivity appears feasible. (Author abstract modified)

59799 **APTIC NO. 76288**

Fontijn, Arthur and Roy Ellison

HOMOGENEOUS GAS PHASE CHEMILUMINESCENCE MEASUREMENT OF REACTIVE HYDROCARBON AIR POLLUTANTS BY REACTION WITH OXYGEN ATOMS. *Environ. Sci. Technol., 9(13):1157-1163, Dec. 1975. 19 refs.*

A continuous flow method for measuring total (photochemical smog) reactivity of dilute hydrocarbon mixtures is described. The difference between the OH (A2 sigma-X2-Pi) emission intensities at 308.9 and 312.2 nm from O-atom/hydrocarbon reactions near 1 torr is measured. For ethylene, I308.9 is much greater than I312.2, while for actetylene, I308.9 approximately equals I312.2. All olefinic, dienic, paraffinic, and aromatic hydrocarbons yield the same spectral distributions as ethylene. Methane yields no observable emission. The response to hydrocarbon mixtures is additive. A limit of sensitivity of 0.2 ppm of C2H4 equivalent hydrocarbon and a linear response to individual hydrocarbons to greater than 1000 ppm are obtained. This sensitivity range is sufficient for mobile engine exhaust bag sample monitoring. Greater sensitivity for ambient air monitoring applications are feasible. Carbon monoxide, carbon dioxide, sulfur dioxide, CH4, C2H2, and nitrogen oxides do not interfere with apparatus response. (Author abstract modified)

59800 **APTIC NO. 82726**

Fox, Marye Anne and Stuart W. Staley

ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN ATMOSPHERIC PARTICULATE MATTER BY HIGH PRESSURE LIQUID CHROMATOGRAPHY COUPLED WITH FLUORESCENCE TECHNIQUES. *Preprint, Maryland Univ., College Park, Dept. of Chemistry, 31p., 1975. 78 refs.*

High pressure liquid chromatography coupled with on-line fluorescence detection was used to determine the concentrations of several polycyclic aromatic hydrocarbons present in atmospheric particulate matter in a heavily-traveled traffic tunnel and in relatively clean suburban air. The chromatographic fractions were identified by comparing retention times and fluorescence spectra of individual analytical components with data for authentic samples and also by obtaining mass spectra of individual fractions. Efficient separations and a significant increase in sensitivity over other methods were achieved. Approximately 90 picograms of benzo(3-4)pyrene were required to obtain a signal-to-noise ratio of 2 with high pressure liquid chromatography/fluorescence detector when operated in the air saturated mobile phase. When the mobile phase was deoxygenated, only 25 picograms of benzo(3-4)pyrene were required for this response. A benzo(3-4)pyrene concentration of 66 nanograms/cu m was measured in the Baltimore Harbor Tunnel; this level was high compared to typical concentrations in urban areas in the United States (0.1-60 nanograms/cu m). Benzo(3-4)pyrene concentrations in suburban air averaged 3.2 nanograms/cu m.

59801 **APTIC NO. 83774**

Freeman, J. S.

LIDAR SPOTLIGHTS ATMOSPHERIC POLLUTION. *Process Eng., p. 97, 99, April 1975.*

The use of laser direction and ranging equipment to monitor the behavior of discharges to the atmosphere is discussed. It is possible to determine the extinction coefficient of a smoke plume from the ratio of accurate measurement of the clear air scattering signals from the far and near sides of the plume. Several plumes occurring along a particular bearing can be detected even though the near plumes attenuate the signals from the more distant targets. Cross sectional spreading velocities of plumes are measured and correlated to wind speed measurements in the vicinity of a stack. Specific particulate and gaseous pollutants are identified with laser systems and concentrations can be determined from measurements made with such systems. Most of the common pollutants such as sulfur dioxide or carbon monoxide have well documented absorption spectra.

59802 **APTIC NO. 82463**

Fritz, Markus

LASER - A BUNDLED RAY OF HOPE. *(Laser - ein gebuendelter Hoffnungsstrahl). Text in German. Tech. Umweltmag., (4):28-29, Aug. 1975.*

The uses of lasers in nuclear fusion experiments and in air pollution monitoring are reviewed. Due to its high energy, coherence and polarization, the laser is of particular value in the remote monitoring of air pollution and of pollutant dispersion, and in the study of atmospheric transfer processes. It can be used even under poor visibility conditions.

59803 **APTIC NO. 82149**

Fujimura, Mitsuru and Yoshikazu Hashimoto

ANALYSIS OF SIZE DISTRIBUTION DATA OF PARTICULATE MATTERS BY ANDERSEN SAMPLER. *(Andasen sanpura ni yoru earozoru no ryudo bunpu no kaiseki). Text in Japanese. Bunseki Kagaku (Japan Analyst), 24(1):36-41, Jan. 1975. 6 refs.*

A method of data treatment for the size distribution of aerosols is proposed. An intuitively understandable size distribution curve is prepared by differentiation of a cumulative distribution curve. A cumulative distribution curve is first drawn by plotting the percentages of cumulative weight on a semilogarithmic graph paper. The curve is then differentiated to get a frequency distribution curve by plotting the gradient of the cumulative distribution curve. The gradient distribution curve thus obtained can be treated quantitatively and it is suitable for providing an intuitive picture of the size distribution spectrum of the aerosol. An actual size distribution curve was prepared by this method, producing two peaks, at around 4 micron and at a smaller size. Atomic absorption analysis of the same aerosol sample indicated that the peak of iron is at around 4 micron and that of zinc is at around 0.9 micron. (Author abstract modified)

59804 **APTIC NO. 76275**

Fukaya, M.

AUTOMATED MEASURING DEVICE FOR NOX AND ITS SYSTEM. *(NOx jido keisokuki to sono hoshiki). Text in Japanese. Otomeishion (Automation), 20(9):13-17, Sept. 1975.*

Many types of automatic nitrogen oxides analyzer have been developed in the last four or five years. Presently available automatic continuous analysis methods for NOx are reviewed. A description of the characteristics of the chemiluminescence method, infrared absorption spectroscopy, ultraviolet absorption spectroscopy, electrolytic methods, and coulometry is given with the measurement range and applicability of each method. The effects of water, sulfur dioxide, carbon dioxide, ammonia, and other substances on measurement accuracy are discussed with available experimental data. Problems involved in the sampling process, such as the dissolution loss of NO2, are also discussed. Descriptions of a calculation method for residual oxygen concentration and a continuous O2 analyzer are given.

59805 **APTIC NO. 84659**

Fukuchi, T.

PRESENT SITUATION OF MIXTURE METHOD OF STANDARD GASES FOR POLLUTION CONTROL TESTS. *(Kogaiyo hyojun gasu no shitsuryohi kongoho no genjo). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc. Japan.), 24(6):282-286, June 1975.*

The Tokyo Industrial Experiment Station and Measurement Institute are in charge of establishing standard gas standards to be used for air pollution detection purposes. The method originally adopted by the National Bureau of Standards and the Environmental Protection Agency of the U. S. is followed in preparing a standard gas. Accuracy of gas concentrations depends upon precision of weight and precision in determining the volume of impurities in the diluted gas. Since there are balances of which the relative measurement precision is in the order of 10 to the -7th, much depends upon the ability to determine impurities. At the Measurement Institute, there is a precision balance capable of measuring up to 30 kg, with 1 mg sensitivity, for study of this method of preparing a standard gas. There is a similar balance at the Chemicals Examination Association, to standardize the gas in bombs. Studies are being made on the determination of purity of pure gas at Tokyo Industrial Experiment Station.

59806 **APTIC NO. 83863**

Fukuoka, Saburo, Toshio Ohira, and Tetsuto Komeiji

DEVELOPMENT OF THE AUTOMATIC MEASUREMENT APPARATUS FOR RAIN WATER COMPONENTS AND ITS RESULTS. *(Usui seibun jido keisokuki no kaihatsu to sokutei kekka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):376, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 123.)*

A new automatic rain water analyzer is described. The analyzer has three major functional parts; a rain collection and analysis part, a pluviometric part, and a recording part. Raindrops greater than 0.6 mm in diameter activate a program timer that opens the cover of a rain water receiver. In the rain water analysis part, electroconductivity, water temperature, and pH measurement cells are connected in series. Rain water collected at the receiver flows down through these three cells in turn. Water passed through the pH cell is collected in a 100 ml storage bottle. A continuous rain water collection is possible up to five bottles full. Electroconductivity can be measured with 0.03 mm rainfall, while the pH measurement can be done with 0.05 mm rainfall. When the rain stops, the rainfall sensing part detects it and the cover of the rain water receiver closes.

59807 **APTIC NO. 82163**

Funke, Maurice F. and James F. Bald, Jr.

CHEMICAL REACTION TRANSDUCERS FOR USE WITH FLUERIC GAS CONCENTRATION SENSING SYSTEMS. *(Dept. of the Army, Washington, D. C.) U. S. Pat. 3,915,645. 7p., Oct. 28, 1975. 8 refs. (Appl. April 24, 1973, 4 claims).*

A method for determining the presence and relative quantity of a reactive component or components in a gas mixture is described which is based on the use of a flueric gas concentration sensing systems. At least one of the components of the gas mixture is altered such that the temperature and/or composition of the gas mixture is altered, thus producing a signal whose frequency is dependent on the absolute temperature and composition of the mixture. The signal generated by the gas which is altered by a chemical reaction is then compared with a signal generated by the unaltered gas or by another modified gas to indicate the change caused by the alteration of the reacted component as well as the presence and relative quantities of this component. (Author abstract modified)

59808 **APTIC NO. 82271**

Fusamura, Nobuo and Takashi Nozaki

SIZE DISTRIBUTION AND CHARACTER OF AIRBORNE PARTICULATE MATTERS. *(Fuyuryushijo busshitsu no ryudo bunpu to seijo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):353, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 99.)*

The size distribution of airborne particulates collected by an Andersen sampler with 8 stages is described. The weight distribution of particles expressed by the cumulative weight frequency did not have a single logarithmic normal distribution for the particle sizes ranging between 0.4 and 10 micron; rather, there were two different distributions, with the separating particle size from 3 to 5 micron. The microscopic observation of particles collected on individual stages of the sampler showed that the differentiating separation by each stage did not quite agree with the theoretical differentiation separation.

59809 **APTIC NO. 82199**

Futsuhara, Natsuho, Kazue Masuda, and Naoomi Yamaki

RESPONSE CHARACTERISTICS OF INDIVIDUAL HYDROCARBONS IN TOTAL HYDROCARBON ANALYZER. *(Zen tankasuiso bunsekikei ni okeru tanka suisorui no oto tokusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):313, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 55.)*

The response character of hydrocarbons in four total hydrocarbon analyzers of different make were examined. The hydrocarbons tested were methane, ethylene, acetylene, propane, propylene, benzene, and toluene which were diluted with air. The signal response of each hydrocarbon was tabulated by the relative response to the methane signal. The response of each hydrocarbon varied with individual analyzers even under the same measurement conditions. The effect of air flow on the signal response was also studied. The response varied greatly with the sample air flow rate; an increased response was observed with decreased sample air flow rate. However, at hydrogen/air ratios greater than 2, stable response could be obtained. The effect on the signal response of supporting air flow to the hydrogen flame was also observed; however, its effect was much smaller than that of the sample air flow.

59810 **APTIC NO. 84184**

Futsuhara, Natsuko, Kazue Masuda, Koji Tsuchimoto, and Naoomi Yamaki

DEVELOPMENT OF NO2-NO CONVERTER FOR THE AMBIENT NOX ANALYZER. *(Kankyo Nox bunsekikei no mochiiru NO2-NO konbata ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):293, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 31.)*

Ten different metal carbides for the conversion of nitrogen dioxide to nitric oxide were examined. The metal carbides studied were of wolfram, molybdenum, chromium, tantalum titanium, vanadium, boron, niobium, zirconium, and silicon. Each metal carbide was placed in a 20 cm long quartz tube, to which air containing 0.6 ppm NO2 and 0.1 ppm NO was passed at a temperature between 100 and 400 C. All carbides except ZrC gave more than 90% conversion of NO2 and NO at 200 C. All carbides except Cr3C2, ZrC, and NbC converted more than 99% NO2 at 300 C. More than 89% NO2 conversion could be achieved at 100 C by the carbides of W, Mo, Cr, Ta, Ti, and V. The thermal stability of WC, Mo2C, and TaC was good even at temperatures greater than 300 C. These three carbides did not oxidize ammonia at temperatures below 250 C.

59811 **APTIC NO. 82070**

Gacogne, Jean-Marie

DETECTOR FOR FUMES AND COMBUSTION GASES. *(Societe Gamma Electronic, Paris (France)) U. S. Pat. 3,909,815. 8p., Sept. 30, 1975. 3 refs. (Appl. Jan. 16, 1974, 13 claims).*

A detector for sensing the occurrence of fumes, gases, or aerosols which are indicative of a fire is described. Prior ionization detectors are undesirably susceptible to external influences such as environmental pollutants and to the wind. In this detector, a predetermined atmosphere of pollutants is established within the reference chamber which precompensates for existing environmental pollutants. A fume detection arrangement is provided which eliminates the need for electrically correcting for the alarm level of the detector. The detector has a housing with a reference ionization chamber and a sensing ionization chamber within it. A radioactive source is positioned in the housing and is arranged for ionization of particles within the chambers. An electrical output signal indicates fumes, vapors, or aerosol in the sensing chamber. (Author abstract modified)

59812 **APTIC NO. 82058**

Gaeke, Gottlieb C.

LOW PRESSURE GAS SAMPLE APPARATUS AND METHOD. *(Ethyl Corp., Richmond, Va.) U. S. Pat, 3,915,013. 8p., Oct. 28, 1975. 4 refs. (Appl. Feb. 4, 1974, 9 claims).*

An apparatus and method for the gas-solid chromatographic analysis of a low pressure gas sample are described. Hydrogen, nitrogen, oxygen, methane, and similar materials which are eluted in the chromatograph column within the first 3 min can be analyzed. Low pressure gas samples are introduced into the column without the substantial flow perturbation found in other systems, which cause anomalous conditions at the detector. The resulting data are extremely useful for precise and accurate calibration and analysis of gas components eluted during the first 5 min of operation.

59813 **APTIC NO. 76540**

Gage, Kenneth S. and William H. Jasperson

THE METRAC POSITIONING SYSTEM: A NEW TOOL FOR AIR POLLUTION RESEARCH AND OPERATIONAL SUPPORT. *J. Air Pollution Control Assoc., 25(11):1141-1144, Nov. 1975. 4 refs.*

The METRAC positioning system is described as a new tool for air pollution research and operational support. The METRAC system is a novel balloon tracking system capable of providing vertical wind soundings of great accuracy and high resolution. It has an immediate application in research on atmospheric wind fields on a scale of interest to air pollution problems. It can be used to track horizontally floating balloons to study atmospheric transport and diffusion. As an operational tool, it can be used to obtain accurate high resolution wind soundings in support of air pollution monitoring and control activities. With an additional modest development effort temperature and humidity sensors may be added to the system flight package and two or more balloons may be tracked simultaneously. (Author conclusions modified)

59814 **APTIC NO. 83439**

Gay, B. W., Jr., R. C. Noonan, J. J. Bufalini, and P. L. Hanst

LONG PATH INFRARED AMBIENT AND LABORATORY MEASUREMENTS, CHEMICAL REACTIONS AND FREON STUDIES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Atmospheric Chemistry and Physics Div., 4p., 1975. 5 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Applications of long path infrared sensing methods are reviewed. Long path infrared studies of the Los Angeles atmosphere indicate that peroxyacetyl nitrate and formic acid are major products of the well-reacted polluted air mass. The long path technique is also being used in the laboratory to measure reactants and products as well as the mechanisms and kinetics of dark reactions involving ozonolysis, photolysis, and photooxidation. With the aid of cold-trapping techniques, long path infrared is being used to measure Freons and halogenated hydrocarbons that exist in the atmosphere at concentrations down to 50 parts per trillion. In the laboratory, Freon and halogenated hydrocarbon reactions are being investigated with respect to the possible depletion of the earth s upper ozone layer.

59815 **APTIC NO. 76338**

Giam, C. S., H. S. Chan, and G. S. Neff

RAPID AND INEXPENSIVE METHOD FOR DETECTION OF POLYCHLORINATED BIPHENYLS AND PHTHALATES IN AIR. *Anal. Chem., 47(13):2319-2320, Nov. 1975. 11 refs.*

A rapid and inexpensive electron-capture gas chromatographic method for detection of polychlorinated biphenyls and phthalates in air was developed. Florisil is used for both sampling and separation of the mixture of pollutants. The method is successful for assessing laboratory and office air, and is useful for the frequently encountered chlorinated hydrocarbons and phthalate esters. This system can be used for monitoring air in industrial plants or other working areas. Organic compounds can be adsorbed and separated by different adsorbents or eluant combinations. Larger columns can be used for shorter sampling times or for detecting lower concentrations of contaminants. An important feature of this procedure is the very low blanks obtained (1 ng or less).

59816 **APTIC NO. 76633**

Gil denskiold, R. S.

ASSESSMENT OF THE INDUSTRIAL BACKGROUND AIR POLLUTION LEVEL FOR MATHEMATICAL PREDICTION. *(Ob uchete fonovogo promyshlennogo zagryazneniya atmosfernogo vozdukha pri raschetnom prognozirovanii). Text in Russian. Gigiena i Sanit., no. 2:56-59, 1975. 3 refs.*

A method is proposed for the determination of the background air pollution level for prognostic and planning purposes in industrial areas. It is unacceptable to predict systematic industrial air pollution concentrations on the basis of arithmetical means of individual background concentration values. Instead, systematic background concentration measurements should be performed at sites where high background concentrations are most likely to occur, and an arithmetic mean should be calculated from the values that exceed the arithmetical mean of all readings. In this manner, it is possible to improve the reliability of the prediction.

59817 **APTIC NO. 76355**

Golden, Bruce M. and Edward S. Yeung

ANALYTICAL LINES FOR LONG-PATH INFRARED ABSORPTION SPECTROMETRY OF AIR POLLUTANTS. *Anal. Chem., 47(13):2132-2135, Nov. 1975. 12 refs.*

A scheme for selecting resonant frequencies for the analysis of gaseous air pollutants using long path absorption of narrow band infrared sources is presented. Emphasis is placed on the infrared spectral region from 4-20 micron, where all gaseous pollutants have vibrational rotational resonances and where diode lasers and gas lasers are known to work well. A computer search was conducted using existing spectrometric data to determine lines with minimum interference and maximum sensitivity. Results are given for ozone, nitrous oxide, carbon monoxide, methane, and nonpolluting water and carbon dioxide. (Author abstract modified)

59818 **APTIC NO. 83029**

Goldstein, Harold W., M. H. Bortner, Robert N. Grenda, Robert Dick, Peter J. LeBel, and Robert A. Lamontagne

THE MEASUREMENT OF CARBON MONOXIDE AND METHANE IN THE NATIONAL CAPITAL AIR QUALITY CONTROL REGION. III. CORRELATION INTERFEROMETER RESULTS. *Preprint, General Electric Co., Philadelphia, Pa., Barringer Research Ltd., Rexdale (Ontario), and Naval Research Lab., Washington, D. C., 3p., 1975. 3 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 1975.)*

The use of a correlation interferometer mounted aboard a helicopter to make measurements of carbon monoxide and methane in the National Capital Air Quality Control Region (Washington, D. C.) is described. Agreement was obtained between the interferometer measurements, infrared Fourier spectrometer measurements, and values calculated from Naval Research Laboratory gas samples. High CO burdens were measured and were correlated with stop-and-go traffic. Only one area of high CH4 burden was determined, but its source was not defined. Remote correlation interferometer measurements agree with ground-and air-truth data and appear

adequate for detecting pollutants at low altitudes from an airborne platform. (Author conclusions modified)

59819 **APTIC NO. 79745**

Gosink, Thomas A.

GC IN ENVIRONMENTAL ANALYSIS. *Environ. Sci. Technol., 9(7):630-634, July 1975.*

Potential applications of gas chromatography in the analysis of atmospheric trace metals are discussed. Elements that are mobilized as gases by microbial action include selenium, tellurium, mercury, and arsenic. The metals form stable volatile methyl compounds. Gas chromatography can differentiate the various chemical species of arsenic. It may be the only way to distinguish between the quantity of a certain arsenic species being applied to a field or watershed against a background of other arsenical residues. Selenium is quite toxic at abnormally high concentrations and is known to form at least two volatile compounds in nature. Gas chromatography can determine selenium down to the 0.1 ppm level without preconcentration measures. The various GC hardware available is reviewed with suitable applications and costs. The thermal conductivity detector is emphasized. Cation analysis is put forward as a means for measuring metals by GC.

59820 **APTIC NO. 80573**

Gourdon, F.

MEASUREMENT AND AUTOMATIC CONTROL OF AIR POLLUTION. *(Mesure et controle automatique de la pollution atmospherique). Text in French. Sci. Munic. Rev. Eau, (70(6):249-258, June 1975.*

Systems and apparatus for manual and automatic sampling and analysis of air pollutants, especially within air quality monitoring networks, are described. An Air Quality Sampler developed in the U. S. uses special plastic bags made of aluminum-coated Mylar or Tedlar for air sampling. The standardized strong acidity method is used for the determination of sulfur dioxide in hydrogen peroxide solution of pH 4.5. This method is equally applicable as a manual or automatic method. When used as an automatic method, the solution pH value is stabilized by the addition of sodium tetraborate. According to a new manual method, sulfur dioxide, nitrogen dioxide, hydrochloric acid, hydrogen sulfide, and fluorine are absorbed on a dry absorbent impregnated with an adequate reagent. Nitric oxide is determined by a preliminary oxidation to NO2 in ultraviolet light. Nitrogen oxides can also be measured by chemiluminescent method, especially by the oxidation of NO into NO2 by means of ozone. Sulfur dioxide can be measured by automatic flame photometry.

59821 **APTIC NO. 81647**

Gravatt, Claude C., Jr.

LIGHT SCATTERING METHOD AND APPARATUS FOR THE CHEMICAL CHARACTERIZATION OF PARTICULATE MATTER. *(Dept. of Commerce, Washington, D. C.) U. S. Pat. 3,901,602. 7p., Aug. 26, 1975. 2 refs. (Appl. May 13, 1974, 10 claims).*

A light scattering method and apparatus for chemically characterizing particulate matter at its source without collecting and chemically analyzing it are described. A smoke detector apparatus was developed which readily distinguishes between carbon containing and non-carbon containing aerosols. The photodetectors which measure the intensities of the first and second scattered light beams are connected to any electronic device capable of detecting slopes, such as a ratio detector, an X-Y oscilloscope, or X-Y recorder. The slope of the recording is relatively small for carbon containing aerosols and relatively large for non-carbon containing aerosols. Fire produced smoke is readily distinguished from other aerosols of similar density. This is an advantage over other techniques which cannot make the distinction.

59822 **APTIC NO. 76325**

Greinke, R. A. and I. C. Lewis

DEVELOPMENT OF A GAS CHROMATOGRAPHIC-ULTRAVIOLET ABSORPTION SPECTROMETRIC METHOD FOR MONITORING PETROLEUM PITCH VOLATILES IN THE ENVIRONMENT. *Anal. Chem., 47(13):2151-2155, Nov. 1975. 13 refs.*

A gas chromatographic (GC) and ultraviolet absorption spectroscopic (UV) procedure was developed for the specific analysis of volatiles from petroleum pitch. These techniques are used in conjunction with mass spectrometry to identify nine of the major volatile compounds in petroleum pitch. The identified compounds in petroleum pitch volatiles are methyl substituted aromatics and include: methylchrysene, dimethylchrysene, methylphenanthrene, and methylpyrene. These compounds together with five other identified aromatic hydrocarbons were used in a combined GC-UV method for monitoring petroleum pitch volatiles. This analytical method, which shows a detection limit of approximately 0.5 microgram/compound, was tested for analysis of commercial petroleum pitches. (Author abstract modified)

59823 **APTIC NO. 81932**

Greinke, R. A. and I. C. Lewis

THE DEVELOPMENT OF A GAS CHROMATOGRAPHIC-ULTRAVIOLET ABSORPTION SPECTROMETRIC METHOD FOR MONITORING PETROLEUM PITCH VOLATILES IN THE ENVIRONMENT. *Am. Chem. Soc. Petrol. Chem. Preprints, 20(4):787-796, Sept. 1975. 13 refs. (Presented at the American Chemical Society, Division of Petroleum Chemistry, Inc., Symposium on Chemistry, Occurrence, and Measurement of Polynuclear Aromatic Hydrocarbons, Chicago, Ill., Aug. 24-29, 1975.)*

A gas chromatographic-ultraviolet absorption spectrometric method for analyzing petroleum pitch volatiles is described. A gas chromatograph equipped with a flame ionization detector is modified with a trapping assembly. A 10-foot by 1/8-inch (outside diameter) stainless steel column, packed with 3 wt% Dexsil 300 GC on Chromosorb G, is employed for the separations. The chromatograph is programmed at 6 C/min from 175-350 C. The stainless steel injection port liner is kept at 340 C since injection port temperatures above 340 C can cause some of the polynuclear compounds to decompose. The effluent from the column is passed through a 10/l splitter such that 9% of the effluent proceeds to the flame ionization detector and 91% is available for trapping and subsequent ultraviolet measurement. A Cary Model 14 spectrophotometer is used for measuring the ultraviolet spectra of trapped polynuclear compounds. The procedure can be used to identify the following aromatic hydrocarbon components of petroleum pitch volatiles: methylphenanthrenes, pyrene, methylpyrenes, chrysene, 1,2-benzanthracene, methylchrysenes, dimethylchrysenes, benzo(1-2)pyrene, and benzo(3-4)pyrene.

59824 **APTIC NO. 82561**

Haas, Edward C.

APPARATUS FOR DETECTION OF PHOSPHORUS OR SULFUR CONTAINING VAPORS OR AEROSOLS. *(Dept. of the Navy, Washington, D. C.) U. S. Pat. 3,877,819. 7p., April 15, 1975. 7 refs. (Appl. Feb. 21, 1968, 6 claims).*

A hydrogen burner capable of detecting phosphorus and sulfur bearing vapors and aerosols is described. The burner is a block of aluminum with borings within forming burning chambers and a flame channel. The air sample and hydrogen gas are drawn through at a high velocity which requires burning in a first chamber to eliminate the excess oxygen and then a second burning near a narrow flame channel. The flame is drawn into the flame channel and the reducing portion is observed through a viewing port. The burner is cooled by a water circulating system. The air contaminant is detected by utilizing the chemiluminescence phenomenon. The light emitted by the reducing portion of the flame is passed through a twolcolor rotatory color filter which allows pulses of different intensity to strike a phototube. The difference in intensity is amplified and used to activate some type of indicator or alarm. (Author abstract modified)

59825 **APTIC NO. 82102**

Habuka, Y., Y. Seki, and F. Kin

NOX ANALYTICAL MEASURING DEVICE BY ULTRAVIOLET ABSORPTION METHOD. *(Shigaisen kyushuho ni yoru NOx bunseki keisokuki). Text in Japanese. Otomeshon (Automation), 20(9):46-50, Sept. 1975.*

A Mitsubishi SA-302 model flue gas analyzer is described. The apparatus is usable in three ranges for nitrogen oxides analysis (0-100, 0-250, and 0-500 ppm) and for sulfur dioxide analysis (0-100, 0-500, and 0-1000 ppm). The zero drift and span drift for NOx analysis are plus and minus 0.5% and 1.0%, respectively, at full scale, and those for SO2 analysis are plus and minus 0.25% and 1.0% respectively. The reproducibility is plus and minus 1.0% at full scale. The apparatus is operable from -10 C to 40 C and below 90% relative humidity. The apparatus has the following additional characteristics: interference of coexisting gases is negligible; no converter is needed; and neither drying of gas nor control of flow rate are required. A pretreatment apparatus for the flue gas is required for particularly low NOx and SO2 concentration. An inverse-scrubbing device is needed for flue gas containing exceptionally high concentrations of dusts. A special sampler is used for corrosive gases such as hydrogen fluoride.

59826 **APTIC NO. 80009**

Hadzija, O. and Z. Kozarac

SIMPLE PROCEDURES FOR THE SIMPLE MICRODETERMINATION OF SULPHUR AND HALOGENS IN ORGANIC COMPOUNDS. *Fresenius Z. Anal. Chem., 277(3):191-192, 1975. 9 refs.*

By suitable combination of vanadium pentoxide with lead chromate or elemental antimony as absorbents, a simultaneous gravimetric determination of sulfur and halogens in organic compounds is possible. Substances containing nitrogen can also be analyzed. Carbon dioxide does not affect the determination. (Author abstract)

59827 **APTIC NO. 82372**

Haldeman, Charles W.

GAS ANALYZING. *(Megatech Corp., Billerica, Mass.) U. S. Pat. 3,895,915. 5p., July 22, 1975. 8 refs. (Appl. Aug. 16, 1973, 8 claims).*

A high speed gas analyzer with continuous sampling capability is described which provides volumetric percentages of carbon dioxide, oxygen, and carbon monoxide components in exhaust gases from internal combustion engines. The analyzer consists of float and tube flowmeters interspersed in a flow series with selective sorbents for the gas components to be measured. The tubes of the flowmeters are arranged in parallel and have scales for the display of the volumetric percentages. (Author abstract modified)

59828 **APTIC NO. 80474**

Hancock, S. and A. Slater

A SPECIFIC METHOD FOR THE DETERMINATION OF TRACE CONCENTRATIONS OF TETRAMETHYL- AND TETRAETHYLLEAD VAPOURS IN AIR. *Analyst, 100(1191):422-429, June 1975. 12 refs.*

A method for the specific determination of tetraalkyllead vapor in air is described. The atmosphere is passed through a solution of iodine monochloride in hydrochloric acid, which converts the tetraalkyllead compounds into their dialkylead ionic forms. The dialkyllead species are preferentially extracted as dithizonates from the buffered sample solution in the presence of ethylene-diaminetetraacetic acid, which complexes any inorganic Pb compounds that may be present. The dialkyllead dithizonates are decomposed by shaking with a nitric acid-hydrogen peroxide solution and the concentration of Pb in the resulting solution is determined by atomic absorption spectrophtometry. The method has a limit of detection of 7 ng of Pb in the sample. When expressed as a concentration of tetraalkyllead in air the detection limit is 0.2 microgram/cu m for a 10-minute sampling period and 0.04 microgram/cu m for a 1-hour sampling period. (Author abstract modified)

59829 **APTIC NO. 82292**

Hara, Noboru

SAMPLING OF AIR FOR DETERMINATION OF HYDROGEN CYANIDE. *Ind. Health (Japan), 13(3):129-134, Sept. 1975. 3 refs.*

The absorbing efficiency of midget impingers was studied. Volumes of absorbing solution tested were 5, 10, and 20 ml, velocities of the test air were 0.5, 1, and 2 l/min, and volumes of passed air were between 10 and 20 l. The concentration of hydrogen cyanide in the test air was 10 to 20 ppm. The amount of cyanide ion captured in each impinger was determined colorimetrically. A midget impinger containing aqueous sodium hydroxide as the absorbing solution was found to be well suited for sampling HCN in air. The sampling efficiency was greatly affected by the absorbing conditions. The NaOH in the solution is gradually consumed by carbon dioxide in the passing air. The solution containing cyanide compounds generated HCN gas, if the alkalinity of the solutions was lost. It is also very important that the passing velocity of test air should not be too small. (Author abstract modified)

59830 **APTIC NO. 82884**

Harada, Yoshiyuki, Nobuyuki Ishizaka, Yoshihiro Kitazawa, and Takashi Mukoda

DATA COLLECTION BY AIR POLLUTION MONITORING TELEMETER SYSTEM. *(Taikiosen joji kanshi teremeta sisutemu ni yoru deta shushu ni tsuite no ichi kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):425, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 298.)*

The conformity of data obtained automatically by telemetry with data read manually from charts was evaluated using data for sulfur oxides, dust, nitric oxide, nitrogen dioxide, oxidants, and carbon monoxide. The difference (di) between telemetry data (Xi) and chart data (xi) (di equals Xi - xi) was calculated, and frequency distributions of di were determined. The average di and ratio of data outside the range of allowable error, which is the sum of chart reading error (0.5% of full scale) and telemetry error (0.5% of full scale), were -0.5 and 13.1% for SOx, -0.8 and 0.3% for dust, -4.9 and 54.3% for NO, -2.9 and 27.7% for NO2, -0.3 and 5.5% for oxidants and -1.8 and 3.7% for CO. The ratio of data requiring adjustment was classified according to the causes of error, such as intrumental malfunction. About 90% of the data required no adjustment, the remaining 10% did require adjustment.

59831 **APTIC NO. 82444**

Harmsen, Hans

ON THE DEVELOPMENT OF THE MEASUREMENT TECHNOLOGY AND AUTOMATIC DETERMINATION OF POLLUTANTS IN WASTE GASES, WASTE WATER AND OPEN WATER BODIES. *(Zur Entwicklung der Messtechnik und automatische Erfassung von Verunreinigungen in Abgasen, Abwaessern und offenen Gewaessern). Text in German. Forum Umwelthyg., 1(2-3):50-51, 1975.*

The development of the measurement technology and automatic monitoring of pollutants in waste gases, wastewater and in surface water bodies in West Germany are reviewed. A device for the automatic measurement of sulfur dioxide concentrations in air and in flue gases by a conductimetric method

(Picoflux) had been developed originally for SO2 measurements at the Leverkusen plant. Similar measuring systems were later developed for carbon dioxide, hydrogen sulfide, nitric oxide, nitrogen dioxide, and chlorine. A new autonomous electrochemical measuring system (Picos) with minimal maintenance requirements, was developed for NO, NO2, total nitrogen oxides, H2S, hydrogen cyanide, and chlorine. This system can be integrated in automatic monitoring networks.

59832 **APTIC NO. 82162**

Harris, Bernard and Lorenzo Willard Richards

METHOD AND MEANS FOR QUANTITIVE ANALYSIS OF SULFURIC ACID- CONTAINING GASES. *(Cabot Corp., Boston, Mass.) U. S. Pat. 3,915,646. 7p., Oct. 28, 1975. 3 refs. (Appl. Sept. 30, 1974, 9 claims).*

A method for the quantitative analysis of sulfuric acid vapor or aerosol in a gas stream such as the exhaust from a catalytic converter is described. The gas stream is contacted with a volume of extractant water having a substantial exposed surface. The resulting sulfur acid/water solution is then diluted and washed with a known quantity of water to provide a collected sulfuric acid-containing liquid aliquot of known volume. The electrical conductivity of the aliquot is then determined and related to the quantity of sulfuric acid in the aliquot. (Author summary modified)

59833 **APTIC NO. 79274**

Harris, Franklin S., Jr.

LASER APPLICATIONS TO ATMOSPHERIC SCIENCES -- A BIBLIOGRAPHY. *Old Dominion Univ., Norfolk, Va., National Aeronautics and Space Administration Contract NGR 47-003-068, Rept. NASA CR-2536, 134p., June 1975. 1460 refs.*

A bibliography of 1460 references on the applications of lasers to atmospheric sciences is included. The subjects covered include aerosols; clouds; the distribution and motion of atmospheric natural and manmade constituents; winds; temperature; turbulence; scintillation; elastic, Raman, and resonance scattering; fluorescence; absorption and transmission; the application of the Doppler effect; and visibility. Instrumentation, in particular lidar, is included, also data handling, and interpretation of the data for meteorological processes. (Author abstract)

59834 **APTIC NO. 82649**

Hase, A., P. H. Lin, and Ronald A. Hites

ANALYSIS OF COMPLEX POLYCYCLIC AROMATIC HYDROCARBON MIXTURES BY COMPUTERIZED GC/MS. *Preprint, Massachusetts Inst. of Tech., Cambridge, Dept. of Chemical Engineering, 16p., 1975. 13 refs. (Presented at the Polynuclear Aromatic Hydrocarbons Symposium, Columbus, Ohio, Oct. 15-17, 1975.)*

The application of computerized gas chromatographic mass spectrometry to the analysis of complex mixtures of polycyclic aromatic hydrocarbons is discussed. Mass spectrometry is an excellent technique for determining the empirial formula of individual polycyclic aromatic hydrocarbons, although this technique cannot distinguish between isomeric ring systems or alkyl isomers. A detailed analysis of the components in complex mixtures of polycyclic aromatic hydrocarbons can be obtained by combining the isomer specificity of gas chromatography with the identification power of mass spectrometry. The combination technique does not require extensive preparations and is very rapid when combined with computerized data acquisition. A gas chromatogram of compounds produced in a sooting methane/air diffusion flame reveals the presence of naphthalene, acenaphthylene, phenanthrene, anthracene, 4,5-methylenephenanthrene, fluoranthene, benzoacenaphthylene, pyrene, benzo(ghi)fluoranthene, and cyclopenta(c,d)pyrene.

59835 **APTIC NO. 76267**

Hashizume, M. and H. Shimoto

EXTRACTING TECHNOLOGY OF THE ATMOSPHERIC TAR SUBSTANCE. *(Kichu taru-jo bushitsu jokyo gijutsu). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), vol. 1975: 79-81, 1975.*

In basic engineering studies on the collection and removal of tarry air pollutants, white smoke containing suspended particulates of tarry substances is used for testing experimental collecting devices. A device for producing white smoke containing suspended particulates of tarry substances with concentration and flow rate control systems was developed. The device consists of a closed system tar melting device at constant pressure (0-2 kg/sq cm) and temperature (150-270 C), a constant temperature (150-280 C) flow regulator, a constant temperature (150-300 C) hot plate vaporizer, and a thermostated (120 C) air tank for maintaining tar vapors with a slide damper for controlling the flow rate of tarry air pollutants solidified by cooling. A flow sheet for the device is included. The concentration of tarry air pollutant emitted from various measured sources was in the range of 2.0-20 g/cu m. Therefore, the conditions for producing white smoke in the abovementioned concentration range are being investigated.

59836 **APTIC NO. 83415**

Hawthorne, A. R., R. P. Gardner, and T. G. Dzubay

MONTE CARLO SIMULATION OF SELF-ABSORPTION EFFECTS IN ELEMENTAL XRF ANALYSIS OF ATMOSPHERIC PARTICULATES COLLECTED ON FILTERS. *Preprint, North Carolina State Univ., Raleigh and Environmental Protection Agency, Research Triangle Park, N. C., Environmental Science Research Lab., 14p., 1975. 16 refs.*

Monte Carlo simulation is used to determine self-absorption effects in the elemental X-ray fluorescence analysis of atmospheric particulates collected on filters. Results are obtained for sulfur attenuation in thin layers, long cylinders, and spheres composed of various matrix materials. For layer samples in which the enhancement is small, the analytical expression for the layer attenuation factor can be used in conjunction with the mean entrance and exit angles as determined from the Monte Carlo results for a thin sample in which absorption effects are negligible. The exception is when the mass-absorption coefficient for the fluorescent radiation is not larger than the mass absorption coefficient for the incident exciting radiation. For self-absorption in spheres, the approximate analytical equation can be used in both cases since the angular dependence is not large. For samples in which there is enhancement, the analytical attenuation factor can be multiplied by the Monte Carlo determined ratio which includes enhancement to yield the proper attenuation factor. (Author conclusions modified)

59837 **APTIC NO. 83200**

Hayashi, Hisao, Hiroko Shimada, Tetsuo Ishida, and Masanobu Nagata

EXTRACTION METHOD FOR SEVERAL SUBSTANCES IN AIRBORNE PARTICULATE BY ULTRASONIC WAVE. *(Cho-onpa ni yoru fuyufunjin chu no seibun chushutsuho ni tsuite). Text in Japanese. Japan Soc. Air Pollut. Annu. Meet., 16th, Niigata, 1975.*

A method for extracting water-soluble and benzene-soluble components from airborne dusts by an ultrasonic wave was studied. For the extraction of the water-soluble components, a filter paper with collected airborne dust was placed in distilled water, then irradiated by a 50 KHz ultrasonic wave for 10 min. The extracted sulfate and nitrate ion concentrations were determined by turbidimetry and the xylenol methods, respectively. The concentrations determined were then compared with the concentrations determined by using the conventional heat extraction method for 90 min. The correlation factor for nitrate determination by the ultrasonic wave and by the heat extraction method was 0.96, and that for the sulfate determination was 0.95. The recovery of nitrate and sulfate ions on the filter paper was 100 + or - 10% by the ultrasonic wave extraction method. For the extraction of the benzene-soluble components, ultrasonic extraction was conducted for 30 min; the conventional soxhlet extraction of the same sample took 6 to 8 hr. The correlation of these two methods was 0.99 for the extraction of the benzene-soluble components.

59838 **APTIC NO. 76515**

Heath, D. F., A. J. Krueger, H. A. Roeder, and B. D. Henderson

THE SOLAR BACKSCATTER ULTRAVIOLET AND TOTAL OZONE MAPPING SPECTROMETER (SBUV/TOMS) FOR NIMBUS G. *Opt. Eng., 14(4):323-331, July/Aug. 1975. 4 refs.*

The solar backscatter ultraviolet and total ozone mapping spectrometer (SBUV/TOMS) for NIMBUS G is described. The instrument is an expanded capability version of the Backscatter Ultraviolet (BUV) instrument and has a wider wavelength range, a cross-course mapper, and special provisions for minimizing the effects of space radiation. The BUV instrument is a double (tandem) Ebert-Fastie spectrophotometer measuring spectral intensities at 12 wavelengths from 2555 A to 3398 A with a 10-A bandpass. The SBUV is similar in design to the BUV. It features a state of the art double monochromator that maximizes throughput while providing good wavelength resolution, accuracy, and very high stray light rejection (10 to the 6th power). The TOMS is an ozone mapping system utilizing a close replica of the first monochromator of the SBUV. (Author abstract modified)

59839 **APTIC NO. 83787**

Heimke, Guenther, Bernd von Chiari, and Ernst Gugel

GAS AND EMISSION CONTROL WITH THE AID OF CERAMIC OXYGEN ION CONDUCTORS. *(Gas- und Emissionsueberwachung mittels keramischer Sauerstoffionenleiter). Text in German. Ber. Deut. Keram. Ges., 52(10):321-324, 1975. 5 refs.*

Measurements of gas and emission control by means of the endOmess instrument, a ceramic oxygen ion conductor, were presented. The measuring principle was based on the property of the ceramic working material zirconium dioxide to conduct electric current in the form of oxygen ions within a certain temperature range. A partial O2 pressure differential between 2 spaces in the instrument with varying electrode charges was created to determine variable O2 concentrations, which were calculated with the Nernst Equation. Its range of application covered measuring, regulation and control of the O2 content in protective gases such as N2, argon or helium, and reco ding partial oxygen pressure promptly and accurately. Other uses were in the field of smoke and flue gas control, observation of diffusion or permeation processes, and of checking oxygen content in a tunnel kiln atmosphere in ceramic manufacture. For proper utilization, it was necessary to arrange gas sample withdrawal from a site where gas composition was adequately representative of the total kiln volume and of the desired firing objective.

59840 **APTIC NO. 80359**

Heins, Conrad F., F. Douglas Johnson, and Edward C. Mangold

MONITORING THE ENVIRONMENT. *Environ. Sci. Technol., 9(8):720-725, Aug. 1975. 4 refs.*

Four developments that are transforming the entire field of environmental measurement are discussed. They are spectroscopy, satellite transmission of environmental data, remote sensing, and computerized data processing. The demand created by the Clean Air Act and other environmental legislation could not be met by existing measuring methods. New techniques were devised to meet the need. Wet chemical methods for measuring atmospheric pollutants can be replaced by advanced spectroscopic methods. Spectroscopy measures pollutant concentratons by analyzing the effects of pollutant molecules on electromagnetic radiation. Remote sensing techniques offer great promise for monitoring environmental quality. A correlation spectrometer is available that uses sunlight scattered from molecules in the atmosphere to measure concentratons of sulfur dioxide, nitrogen dioxide, or carbon monoxide. A laser system, LIDAR, is used to measure the opacity of smoke plumes emitted from smokestacks. There is a much greater potential for satellite sensing due to the development of specialized computer programs for data interpretation. Examples of their applications using the LANDSAT and GOES satellite systems are included.

59841 **APTIC NO. 82727**

Hilborn, J. C., W. J. Findlay, and N. Quickert

THE APPLICATION OF CHEMILUMINESCENCE TO THE MEASUREMENT OF REACTIVE HYDROCARBONS IN AMBIENT AIR. *Preprint, Environmental Protection Service, Ottawa (Ontario), Chemistry Div., 7p., 1975. 9 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

A converted ozone monitor which measures unsaturated hydrocarbons using chemiluminescence is described. The only modification to the monitor involves the substitution of the ozone source for the ethylene supply system. The instrument responds to all hydrocarbons having an olefinic double bond as well as to compounds containing sulfide or amine groups. A comparison of the output of the monitor with that of a conventional non-methane hydrocarbon monitor gives qualitatively similar regults. The sensitivity of the monitor is 10 times that of conventional non-methane hydrocarbon monitors, and its output is direct. (Author summary modified)

59842 **APTIC NO. 83934**

Hinohara, Keiichi

BALANCED TYPE SAMPLER. *(Heikogata shiryo saishukukan). Text in Japanese. (Mitaka Kogyo K. K. (Japan)) Japan. Pat. Sho 50-33874. 5p., Nov. 4, 1975. (Appl. Feb. 17, 1972, 1 claim).*

A balanced-type sampler for measuring the concentration of dust and soot contained in exhaust gas is described. This sampler will accurately reflect the concentration of the dust and soot in exhaust gas, and is an improvement over a conventional balanced sampler. The inside diameter of the sampler tube is larger than the inlet opening. An inside static pressure measuring channel is installed along the inner circular wall of the sampler tube, and the distance from the end of the inlet opening to the channel is 1.5 to 4 times the inner diameter of the sampler inlet. During sampling, the inlet directly faces the flow of the exhaust gas and the exhaust gas will be aspirated into the sampler. The static pressure measuring channel has an opening to the tube. The inner diameter of this tube is larger than the inner diameter of the inlet. This configuration causes the velocity of the gas flow to decrease and the static pressure to increase more than in a conventional sampler. This supplements the loss of pressure in the tube due to friction and pressure loss of the flow head.

59843 **APTIC NO. 83949**

Hiratsuka, Yutaka and Kenji Odajima

NEW SAMPLING APPARATUS FOR STACK GAS. *(Endo haigasu bunseki kei yo shin sanpuringu sochi). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):383, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 130.)*

A new sampling apparatus for stack gas analysis is described. The apparatus consists of four sub-chambers each of which contains a collision plate and is separated by a nozzle. The collision plates are cooled to 2 C. The plate at the stack gas inlet side has a lower temperature than the plate in the next sub-chamber, and the plate temperature is designed to decrease gradually towards the stack gas outlet. The nozzle diameter between two sub-chambers is gradually decreased from the inlet side to outlet side ratios of 2, 3, and 1. The stack gas enters the sampling apparatus and collides with the first collision plate in the first sub-chamber. Dust components in the stack gas are removed by the collision plate and the moisture content in the stack gas is removed by condensation on the low-temperature collision plate. The purified stack gas at the first sub-chamber enters into the second sub-chamber through the nozzle between the first and second sub-chambers, and further purification occurs. The overall dust removal efficiency by this four-step cleaning apparatus is 97%, which is equivalent to that obtainable with a filter method. Since the condensed water helps to wash out the dust on the collision plates, no accumulation of dust on the plates occurs, which allows the sampling operation to continue for more than 1 month without maintenance. The loss of gases during removal of dust and moisture is smaller than in the conventional filter method. The loss of sulfur dioxide is 3.6%.

59844 **APTIC NO. 81934**

Hites, Ronald A.

ANALYSIS OF COMPLEX POLYCYCLIC AROMATIC HYDROCARBON MIXTURES BY COMPUTERIZED GC/MS. *Am. Chem. Soc. Petrol. Chem. Preprints, 20(4):824-828, Sept. 1975. 14 refs. (Presented at the American Chemical Society, Division of Petroleum Chemistry, Inc., Symposium on Chemistry, Occurrence, and Measurement of Polynuclear Aromatic Hydrocarbons, Chicago, Ill., Aug. 24-29, 1975.)*

The application of computerized gas chromatography/mass spectrometry techniques to the identification of complex polycyclic aromatic hydrocarbon mixtures is reviewed. The mass spectra of unsubstituted polynuclear compounds consist of a very intense molecular ion accompanied by a few weak fragment ions due to the loss of one to four hydrogen atoms. Upon electron impact induced loss of an electron, a polycyclic aromatic hydrocarbon molecule forms a very stable positive molecular ion which undergoes very little fragmentation. However, because of the lack of fragmentation of unsubstituted polynuclear compounds, it is usually impossible to distinguish between isomeric ring systems solely on the basis of mass spectral data. The mass spectra of alkylated polynuclear compounds show some fragmentation, with the mass spectra of higher homologues frequently displaying intense fragment ions due to the loss of an alkyl group. Although mass spectrometry is an excellent technique for determining the empirical formula of individual polynuclear compounds, gas chromatography is needed in conjunction with it to distinguish between isomeric ring systems and alkyl isomers. The isomer specificity of gas chromatography and the identification power of mass spectrometry make for detailed analyses of complex mixtures of polynuclear compounds. Examples of combined gas chromatography/mass spectrometry analyses of river basin sediments and soot are presented.

59845 **APTIC NO. 80212**

Hodkinson, A.

A METHOD FOR THE SPECTROGRAPHIC ANALYSIS OF SMALL AMOUNTS OF NON-METALLIC STEELWORKS MATERIALS. *British Steel Corp., Port Talbot, Strip Mills Div., Rept. SM/589/A, 5p., March 1975. 2 refs.*

An existing method for the quantitative analysis of a wide variety of materials by emission spectrometry has been modified to suit the Hilger Large Quartz Spectrograph. The technique, which has been developed for determining 19 elements in milligram amounts of corrosion deposits, dusts, water residues, and other miscellaneous materials, is described. The sample, which can be as little as 1.5 mg, is mixed with a buffer consisting of a mixture of lithium fluoride and graphite and burnt in a direct current arc with anode excitation. Cobalt is used as internal standard. The spectra are evaluated by either visual comparison with a Judd-Lewis comparator or a microphotometer for greater precision. The method is applicable to a variety of nonmetallic materials arising in a steelworks. It has been found particularly useful for samples which occur in amounts of 1 or 2 mg, such as corrosion deposits, water residues, atmospheric deposits, and many other ferrous dusts which contaminate plant and electrical equipment, and for which insufficient sample is available for conventional analytical methods. (Author abstract modified)

59846 **APTIC NO. 82478**

Hollingdale-Smith, P. A.

MULTIPLE POLLUTANT MONITORING USING SPECTROSCOPIC AND GAS- CHROMATOGRAPHIC METHODS IN A MOBILE LABORATORY. *Proc. Anal. Div. Chem. Soc., 12(12):317-319, Dec. 1975. 1 ref.*

A multiple pollutant monitoring system using spectroscopic and gas-chromatographic methods in a mobile laboratory is described. The air from which samples are taken for the analysis of gaseous pollutants is drawn from above roof level of the trailer through a vertically mounted glass duct. A fan, mounted below floor level, pulls air through this duct at a rate of 90 cu m/hr, and sampling probes can be inserted so as to take samples from the center of the air stream directly into the long path gas cell, the quadrupole mass spectrometer, or to an adsorbent for subsequent analysis by gas chromatography. When using a path length of 40 m, the absorption bands due to atmospheric water vapor and carbon dioxide mask considerable portions of the spectrum. Optical compensation methods are used to overcome this interference.

59847 **APTIC NO. 80070**

Honma, K.

PARTICULATE MATTERS PRODUCED BY PHOTOOXIDATION IN THE AMOSPHERE. *(Kokagaku sumoggu hassei doki no ryushijo bushitsu ni tsuite). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(5):16-26, Jan. 1975. 8 refs.*

The formation mechanism, chemical composition, and properties of particulate matter sampled during a period of photochemical smog were investigated by the thin metal film method and by energy dispersion type X-ray analysis. In the thin metal film method, particulate samples are collected on a thin film of vapor- deposited metal and the reactivity of particulates to the metal and the condition of the corroded metal surface are examined by optical or electron microscope. Descriptions of quantitative determination procedures for corrosiveness of suspended particulates and measurement equipment are given. In the energy dispersion type X-ray analysis method, the characteristic X-ray wavelength of each element emitted when the sample surface is irradiated with an electron beam is measured using a semiconductor detector. An energy dispersion type X-ray analysis system with a semiconductor detector and a scanning electron microscope is described, with the measurement procedure. An analysis data of particulates sampled during the period of photochemical smog on July 18, 1970, July 23, 1970, June 11, 1972 and Aug. 10, 1973 are compiled and analyzed. Common characteristics of particulates examined in these four cases are discussed.

59848 **APTIC NO. 82361**

Honma, Katsunori and Isamu Sakane

CHARACTERISTICS OF THE MEMBRANE FILTER FLUOROPORE. *(Menburan firuta Furoropoa no roka tokusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):356, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 102.)*

The characteristics of Fluoropore AF07P of Sumitomo Denko Co. were studied using 0.44 micron dioctyl phthalate aerosol, and compared with those of other filters. The initial pressure loss for the filter was 7.7 mm H2O/cm/sec, which was similar to glass fiber filters. The collection efficiency of the filter at a 20 l/min flow rate was 99.8% for the dioctyl phthalate aerosol and 99.9% for room dust, which was comparable or better than the efficiency of other Polyflon filters.

59849 **APTIC NO. 84672**

Honma, Katsunori and Masanori Fukuda

MEASUREMENTS OF ACID PARTICULATE MATTERS IN URBAN ATMOSPHERE AT THE TIME OF PHOTOCHEMICAL SMOG. *(Kokagaku sumogu doki no taikichu sansei ryushijo busshitsu no sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):631, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 366.)*

Acid particles collected from the atmosphere during smoggy conditions were studied by an iron thin film method and compared with particle concentrations measured by a dust counter and measurements of sulfate and nitrate in dust collected by a low volume air sampler. The light transparency of a 500A iron film after sampling was converted to sulfuric acid particle concentration. The indication of acid particle concentration expressed by thin film after sampling increased with time, with equilibrium being reached after 3 days by which time the value increased to four times the initial indication. Two peaks of acid particle concentration were determined in the 24-hour sampling period; one in the early morning and the other in the late morning. If from 20 to 50% of the sulfate ion measured by air sampler is assumed to be sulfuric acid, then the results of the thin film method agreed with those of the air sampler.

59850 **APTIC NO. 80495**

Hoppesch, J. P. and R. C. Domingo

PICOGRAM DETECTION OF SULFUR HEXAFLUORIDE BY HIGH PRESSURE CHARGE EXCHANGE MASS SPECTROMETRY. *Anal. Letters, 8(11):839-848, 1975. 4 refs.*

A method was investigated for the determination of sulfur hexafluoride by high pressure charge exchange mass spectrometry at levels as low as 3 times 10 to the -12 power g. It employs specific ion detection in combination with gas chromatography to insure a high degree of specificity. The method was used to measure ten 1 ml samples of air known to contain 20 ppb SF6. The standard deviation was 4.08%.

59851 **APTIC NO. 82619**

Houben, Wilhelmus P.

CONTINUOUS MONITORING OF CARBON MONOXIDE IN THE ATMOSPHERE BY AN IMPROVED NDIR METHOD. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 10p., 1975. (Presented at the Measurement Accuracy as it Relates to Regulation Compliance Specialty Conference, New Orleans, La., Oct. 27-28, 1975.)*

A new analysis method for carbon monoxide is described involving nondispersive infrared analysis in conjunction with a palladium catalyst and flowing reference cell to minimize spectral interference of other components in air, in particular, of carbon dioxide and water vapor. The detector of the analyzer is sensitized for CO and is equipped with narrow band pass optical filters. The reference cell continuously receives background air which has been treated by the catalyst for conversion of CO to CO2. The sample cell continuously receives the untreated air containing carbon monoxide. Since both sample and reference cells contain the same concentration of water vapor and nearly the same amount of CO2, the resulting differential detector signal is due to the carbon monoxide concentration in the sample cell. The need for bottled zero gas has been eliminated. Calibration procedures are discussed, including use of CO free sample air from the catalyst for zero adjustment. Automatic standardization for long term unattended operation is also described. Unattended analyzer operation for periods of weeks are feasible. (Author abstract modified)

59852 **APTIC NO. 81796**

Howes, J. E., Jr., R. N. Pesut, and J. F. Foster

INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION AND ACCURACY OF THE DETERMINATION OF OXIDES OF NITROGEN IN GASEOUS COMBUSTION PRODUCTS (PHENOL DISULFONIC ACID PROCEDURE) USING ASTM METHOD D 1608-60. *Battelle Memorial Inst., American Society for Testing and Materials Data Series Publication DS55-S8, 117p., 1975 (?). 19 refs.*

An interlaboratory cooperative study of the precision and accuracy of the colorimetric determination of nitrogen oxides in pilot plant and actual source emissions using the phenol disulfonic acid procedure (American Society for Testing and Materials Method D 1608-60) is presented. The between-laboratory component of variance (reproducibility) of NOx determinations over a concentration range of 20-2000 ppm nitrogen dioxide was expressed by the formula 2.21 times the square root of the mean NO2 concentration minus 1.18. The within-laboratory component of variance (repeatability) of NOx over the same NO2 concentration range was expressed by the formula 1.52 times the square root of the mean NO2 concentration minus 4.21. The mean between-laboratory standard error determined from field tests at an oil-fired power plant and a cement kiln for flue gas concentrations ranging from 90-260 ppm NO2 was 14.5 ppm. The ASTM method resulted in NOx determinations which were on the average about 2.5% lower than the Federal Register Method 7. (Author summary modified)

59853 **APTIC NO. 81798**

Howes, J. E., Jr., R. N. Pesut, and J. F. Foster

INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION OF SAMPLING STACKS FOR PARTICULATES AND COLLECTED RESIDUE. *Battelle Memorial Inst., American Society for Testing and Materials Data Series Publication DS55-S6, 157p., 1975 (?). 18 refs.*

The results from an interlaboratory cooperative study of the precision of stack sampling for particulates and collected residue are presented. The mean between-laboratory standard errors (expressed as the coefficient of variation) of measurements at an oil-fired power station, a foundry, a coal-fired power station, and a cement plant (kiln) were: 8.9, 37.7, 7.6, and 5.7%, respectively. The between-laboratory standard error of particulate concentration and emission rate determinations based on data obtained on an oil-fired and a coal-fired electrical generating station and a cement plant were expressed by the following formulas: -0.0003 + 0.060 (mean particulate concentration in grains/standard dry cu ft) and 0.290 + 0.067 (mean particulate concentration), respectively. (Author summary modified)

59854 **APTIC NO. 82646**

Hughes, Ernest E.

THE ROLE OF THE NATIONAL BUREAU OF STANDARDS IN CALIBRATION PROBLEMS ASSOCIATED WITH AIR POLLUTION MEASUREMENTS. *Preprint, American Society for Testing and Materials, Philadelphia, Pa., 16p., 1975. 1 ref. (Presented at the American Society for Testing and Materials Symposium on Calibration, Boulder, Colo., Aug. 7, 1975.)*

The role of the National Bureau of Standards in calibration problems associated with air pollution measurements is discussed, with particular emphasis on the manufacture of Standard Reference Materials for the measurement of automotive emissions. The first step in the production of a SRM is a determination of the need for a particular gas mixture or calibrating device. The pattern followed in the production of a gaseous SRM is as follows: an extensive investigation is performed on the stability of the material in its intended concentration range; purchase specifications are developed for the procurement of a large number of commercially prepared samples; concurrently, a number of primary standards are prepared and observed over a period of time to insure stability; measurements are made to determine the internal consistency of the entire set of primary standards; conventional analytical methods are modified, if necessary, to improve the measurement precision; a set of secondary or working standards are prepared if the quantity of standards required to keep the analysis of the SRM s under adequate control is greater than that available from the primary standards; and the SRM s are individually analyzed for a comparison of the results. Comparisons of independent analyses by a number of competent laboratories are presented for carbon dioxide, propane in air, carbon monoxide, and nitric oxide.

59855 **APTIC NO. 76361**

Huillet, F. Dale

THE MONITORING OF SO2, NO, CO AND OPACITY WITH AN IN-STACK DISPERSIVE SPECTROMETER. *TAPPI, 58(10):94-97, Oct. 1975. (Presented at the Technical Association of the Pulp and Paper Industry Environmental Conference, Denver, Colo., May 14-16, 1975.)*

An in-stack dispersive spectrometer for the monitoring of sulfur dioxide, nitric oxide, carbon monoxide, and opacity is described. The monitor utilizes the single beam principle in a dual wavelength radioing system, which produces most of the advantages of a double beam instrument. Since the instrument has four channels, four different detectors are used, and three different light sources are used to transmit three different collimated polychromatic light beams through the stack. The ranges for the SO2 and CO channels are 0-500 ppm, full scale, for the NO channel 0-600 ppm, and for the opacity channel 0-20%. Operating experiences and accuracy checks at the Scott Paper Co. s Everett, Wash. mill are described.

59856 **APTIC NO. 82779**

Hunt, William F., Jr., Thomas C. Curran, Neil H. Frank, and Robert B. Faoro

USE OF STATISTICAL QUALITY CONTROL PROCEDURES IN ACHIEVING AND MAINTAINING CLEAN AIR. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Monitoring and Data Analysis Div., 14p., 1975. 18 refs. (Presented at the Joint European Organization for Quality Control/International Academy for Quality Conference, Venice Lido, Italy, Sept. 16-18, 1975.)*

The use of statistical quality control procedures for achieving and maintaining clean air is discussed, with particular reference to the statistical analysis of air monitoring data on total suspended particulates. A Dixon Ratio Test works reasonably well in detecting potentially anomalous TSP values, with the exception of detecting multiple transcription errors within a single quarter of data. Other possible solutions are the use of a Grubbs-type statistic for the detection of multiple outliers or the use of a method which is based on the sample range to the standard deviation. Recent studies by the Environmental Protection Agency favor the Dixon Test for flagging potentially anomalous values in TSP data. (Author conclusions modified)

59857 **APTIC NO. 82999**

Huntzicker, James J., Lorne M. Isabelle, and John G. Watson

THE CONTINUOUS MONITORING OF PARTICULATE SULFATE BY FLAME PHOTOMETRY. *Preprint, Oregon Graduate Center, Beaverton, Oreg., 15p., 1975. 22 refs. (Presented at the International Conference on Environmental Sensing and Assessment, Las Vegas, Nev., Sept. 14-19, 1975.)*

The monitoring of ambient levels of particulate sulfur was studied. These levels are equivalent to 0.25 to 25 ppb of sulfur dioxide. Since the generally accepted operational limit of commercially available flame photometric sulfur gas detectors is about 5 ppb, attempts were first made to improve the sensitivity of the flame photometric detector. A sulfur gas analyzer modified to give an output directly proportional to the flame photometer output was used, and calibrated with the West Gaeke method. Since the noise is random, improvement in the signal to noise ratio can be achieved by averaging the signal over a longer time period. Signal to noise ratios implying a lower limit of detection of about 0.7 ppb were obtained with several integrations of 100 sec. The second phase concerned the response of the flame photometer to sulfate aerosol. The aerosol was continuously monitored by sampling a laboratory generated aerosol with a commercially available sulfur gas flame photometer. Aerosols of sulfuric acid or ammonium sulfate in the approximate concentration range of 5 to 75 microgram sulfate ion/cu m gave little or no response in the first part of the second phase. As a result, a preheater was inserted upstream from the flame photometer to convert these ions to SO2. There was a large response to SO4 ions without preheating the air stream in the latter part of the second phase, in agreement with previous results. The most promising prospect for a continuous particulate sulfur analyzer is one in which the gaseous sulfur is removed by a diffusion tube scrubber and the particulate sulfur measured directly by flame photometry. Sensitivity in the concentration range below 10 microgram/cu m sulfate would be achieved by averaging the flame photometer output and periodically updating the instrument zero. The temperature dependent decomposition of the different sulfate compounds offers a potentially powerful tool for determining the chemical speciation of the sulfur containing aerosol. (Author abstract modified)

59858 **APTIC NO. 82573**

Hyne, Edward and Paul Norton

A NEW METHOD OF SAMPLING FOR SUSPENDED PARTICULATES. *Preprint, Connecticut Dept. of Environmental Protection, Hartford, 10p., 1975. 1 ref. (Presented at the Specialty Conference on Air Pollution Measurement as It Relates to Regulation Compliance, New Orleans, La., Oct. 27-28, 1975.)*

Field experience with a low-volume air sampler designed to monitor long-term total suspended particulate levels is reported. The low-volume sampler was comprised of a shelter, filter holder or transition piece, dry gas meter, and a vacuum. The sampler was designed around the constraints that it must have a flow rate large enough to take a representative sample of the time period and that it must have a flow rate small enough to prevent overloading the filter paper. The total average suspended particulate reading obtained with the low-volume sampler over a 6-month period was 63.1 micrograms/cu m as compared with a high-volume sampler reading of 59.7 micrograms/cu m. This indicates that the low-volume air sampler can be used to measure the long-term yearly average for total suspended particulate matter. The major deficiency of the low-volume sampler is its inability to monitor a violation of the 24-hour standard. However, high-volume air samplers are not much better when used on a sample schedule of 61 test days of 365 days per year.

59859 **APTIC NO. 84211**

Ibusuki, Takashi and Kazushige Imagami

GENERATION OF STANDARD GASES FOR ANALYSIS OF GASEOUS AIR POLLUTANTS BY GAS PERMEATION MEMBRANE METHOD. *(Gasu pamieishion menburan ho ni yoru hyojyungasu no hassei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):289, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov, 5-7, 1975, Paper 27.)*

Standard gas preparation by the gas permeation membrane method was studied for nitric oxide, carbon monoxide, methane, ethane, and propane. The membrane used was teflon. The concentration of prepared standard gases were measured by a hydrocarbon analyzer and a chemiluminescence method for NO. With the membrane temperature at 100 C and the gas pressure at 25.0 psig, the permeated gas was mixed with a dilution gas at a flow rate of 2.00 l/min. Under the same permeation surface area, the concentration of the gases prepared was 29.1, 19.13, 13.65, 8.25, and 4.16 ppm for NO, CO, methane, ethane, and propane, respectively. The time required to reach steady state at these concentrations was 5, 5, 10, 25, and 30 minutes, respectively. The reproducibility of the standard gas preparation was satisfactory within 2%. The concentration of the gases prepared increased linearly both with increased membrane temperature and gas pressure.

59860 **APTIC NO. 81748**

Iida, Yoshio and Shizuko Okada

HYDROGEN ANALYSIS BY CHEMICAL IONIZATION GC/MS METHOD. *(Kagaku ionka GC/MS ho ni yoru tanka suisorui no bunseki). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 198, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper 1D17.)*

Hydrocarbon analysis, including benzene, toluene, and xylene, was studied by the chemical ionization gas chromatography-mass spectrometry technique in which methanol is used as the reacting gas. The adsorption of benzene, toluene, and xylene onto a 1 glass sample collection bottle was also examined by filling the bottle with 500 ng of each compound. More than 50% of the compounds adsorbed onto the glass wall at room temperature. The adsorption was 20 to 30% at 100 C and about 10% at 150 C. More than 85% of the adsorbed xylene, benzene, and toluene on the glass bottle could be recovered by washing the bottle with 3 ml or more of methanol. By using a 1 ml gas sample or a 1 microliter liquid smaple, 1 ng of these compounds could be measured by the technique on the basis of a 50 to 60% valley for the MS resolution.

59861 **APTIC NO. 82196**

Imamura, Kiyoshi and Tooru Fuji

STUDIES ON THE ANALYTICAL METHOD OF ATMOSPHERIC CHLORINATED HYDROCARBONS, (2) GC-MF ANALYTICAL METHOD OF VINYL CHLORIDE IN THE ATMOSPHERE. *(Taikichu ensoka tanka suiso no bunsekiho ni kansuru kenkyu, (2) kankyo taikichu no Vinyl Chloride no GC-MF ni yoru bunsekiho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 47, 1975. (Presented at the Japan Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

The analysis of vinyl chloride monomer was studied by mass fragmentography with a gas chromatography-mass spectrometry combination. The determination was made from the peak height at the m/e 62 for which acetaldehyde and Furon-142 gave no peak or a negligible peak height for vinyl chloride monomer determination. A linear calibration curve was obtained up to 100 ppb vinyl chloride monomer with 3 ml standard gas injection. The repeatability of the measurement was good within 2% error. The detection limit by this method was 2 ppb vinyl chloride monomer with the use of 3 ml gas sample. The mass fragmentography method gave a few hundreds greater sensitivity than the simple GC technique for vinyl chloride monomer analysis. Thus no sample concentration step was necessary for this method.

59862 **APTIC NO. 82947**

Imamura, Kiyoshi and Toru Fujii

MEASUREMENT OF CHLORINATED HYDROCARBONS IN ATMOSPHERE, PART III. DETERMINATION OF VINYL CHLORIDE USING GC AND GC-MF METHODS. *(Taikichu ensoka tankasuiso no bunsekiho ni kansuru kenkyu 3, Vinyl Chloride no GC oyobi GC-MF ni yoru bunsekiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):314, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 56.)*

Gas chromatography was compared to GC-mass fragmentography for the analysis of vinyl chloride monomer. A concentration step involving a precolumn is necessary for the GC method, while the GC-MF method can analyze an air sample directly without a concentration step. The latter method is a few hundred time more sensitive than the former method. The detection limit of vinyl chloride monomer was 0.5 ppb by the GC method with the concentration of a 1 liter air sample, while that of the GC-MF method with the use of a 3 ml air sample was 2.0 ppb. With a Porapak-Q column, acetaldehyde interfered with the vinyl chloride monomer peak on the gas chromatogram. This interference can be eliminated with the GC-MF method in which m/e at 62 can be used to determine vinyl chloride monomer.

59863 **APTIC NO. 82955**

Imamura, Kyoshi

MEASURING METHOD OF ATMOSPHERIC VINYL CHLORIDE MONOMER. *(Taikichu no enkabiniru monoma no sokuteiho ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(12): 884-890, Dec. 1975. 7 refs.*

Vinyl chloride monomers (VCM) contamination assessment is a priority necessity since VCM is a cancer causing substance. The analytic method for measuring comparatively high concentrations of VCM (over 0.1 ppm) in exhaust gas and the working environment of factories which are the source of VCM has been studied by the U. S. EPA and the Association of Polyvinylchloride Industries of Japan. The Osaka Metropolitan Environmental Pollution Surveillance Center investigated the analytic method for measuring atmospheric vinylchloride monomers the concentration of which is expressed in ppm to ppb by gas chromatography (GC) and GC-mass spectrometry (MS). The result of the investigation is reported in an analysis covering the sampling method for test material using a handy sampler (Kimoto K.K. MP-Model-1) and a mylar bag, preparation of standard gas by vacuum bottle and by a permeation method, analytic method of GC, GC-mass flow method (MF), and analytic results by GC method and GC-MF method. The GC method requires a concentrating process for the sample material with a VCM concentration expressed in ppb, however, the GC-MF method can detect VCM in concentrations as low as ppb contained in 3 ml of the test air, and will not be affected by acetaldehyde or Freon-142.

59864 **APTIC NO. 81120**

Inomata, Hideyuki and Takashi Igarashi

STUDY OF LASER RADAR SYSTEM USING THE DIFFERENTIAL ABSORPTION METHOD FOR DETECTION OF AIR POLLUTANTS. *Japanese J. Appl. Phys., 14(11):1751-1760, Nov. 1975. 15 refs. (Presented at the Laser Radar Studies of the Atmosphere Conference, 5th, Williamsburg, Va., 1973.)*

A laser radar system using the differential absorption method for remote measurement of atmospheric nitrogen dioxide and sulfur dioxide was investigated. A simultaneous two-wavelength dye laser for transmitter and a simultaneous two-wavelength signal processor for receiver were developed. By the use of this technique, one laser shot allows the determination of NO2 concentrations with an uncertainty equivalent to 44 ppm times delta X(m). The technique is most promising for a range- resolved measurement of ambient molecular pollutants, because it has the advantage of cancelling the effect of atmospheric variation in a measurement when atmospheric aerosols are used as a disturbed reflector. (Author abstract modified)

59865 **APTIC NO. 82203**

Inui, Tomoyuki, Junichi Kohashi, and Haruo Shingu

RAPID AND PRECISE DETERMINATION OF SMALL AMOUNTS OF NOX GAS WITH A TOTAL CONVERSION TYPE COLOR-PRODUCING TUBE. *Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Jap.), 8(7):1186-1192, 1975.*

A simple and accurate method for rapid and precise determination of small amounts of nitrogen oxides with the total conversion type color-producing (TCC) tube, an improvement on the conventional gas detector tube, is described. The color-producing reagent was prepared by spraying 0.06% solution of diphenyl benzidine (DPB) and ammonium chloride in 75% sulfuric acid on 60 to 80 mesh particles of silica gel, calcined at 500 C, pulverized, and then purified. The supported color reagent was extremely sensitive to both nitrogen dioxide and nitric oxide provided that sufficient oxygen is supplied from the environment. The color reaction with NO at the surface film of the reagent particles proceeds instantaneously to completion at a ratio of 11.4 moles NO consumed to 1 mole DPB in the reagent. The TCC tube, constructed of glass tube 1 to 3 mm in diameter and 6 to 8 cm in length filled with the color-producing reagent, was tested for NO analysis with 100 to 200 ml samples of diluted NO at a flow rate below 40 ml/min. The blue color tone and intensity of coloration were constant and uniform throughout the length of coloration, irrespective of temperature and NO concentration. An excellent linear relationship between the length of coloration and the total quantity of NO in the sample was established. A TCC tube of this size can determine 0.3 to 3000 ppm NO with a precision from + or - 0.15 + or - 1.35 ppm. (Author abstract)

59866 **APTIC NO. 80140**

Ioffe, B. V., A. G. Vitenberg, V. N. Borisov, and M. A. Kuznetsov

DETERMINATION OF TRACE IMPURITIES IN GASES BY EITHER EQUILIBRIUM ACCUMULATION IN VOLATILE LIQUIDS. *J. Chromatog., vol. 112: 311-317, Oct. 29, 1975. 10 refs.*

The theoretical substantiation and experimental testing of a new method for the determination of trace amounts of organic compounds in gases by their concentration in a suitable volatile solvent are presented. The method has substantial advantages over the known techniques of concentration of micro-amounts of impurities by adsorbents and non-volatile liquids. The limits of applicability of the proposed method are established only by a theoretical consideration of the process of micro-impurity distribution when the polluted gas is passed through a pure liquid. Formulae are derived for the equilibrium concentration in non-volatile liquids. The method is applied to the determination of simple aromatic hydrocarbons, carbonyl compounds, and diethylamine in air at the level of 0.1-65 microgram/cu m. (Author summary modified)

59867 **APTIC NO. 76106**

Isbell, Arthur F., Jr.

DEVELOPMENT OF SELECTIVE HYDROCARBON SAMPLING SYSTEM AND FIELD EVALUATION WITH CONVENTIONAL ANALYTICAL SYSTEM (FINAL REPORT). *Analytical Research Labs., Inc., Monrovia, Calif., Environmental Protection Agency Contract 68-02-1201, Program Element 1AA010, ROAP 26AAP-30, Rept. EPA-650/2-75-050, 2501-F, 67p., Aug. 1975. 16 refs.*

The design and field testing of a sampling system that permits the determination of the saturate, unsaturate, aromatic, and oxycarbon content of stationary source hydrocarbon vapor emissions are described. A Joy Manufacturing Company Method 5 stack sampler is modified to incorporate a vapor collector cartridge that quantitatively traps all volatile hydrocarbons present in the sampled gas stream. A class analyzer desorbs the sample from this universal collector and passes it through a system of class abstractors that remove certain hydrocarbon classes while permitting the remainder of the sample to pass into cryogenic traps. The contents of each trap are desorbed sequentially through an external flame ionization detector. The quantity of each class present in the sample is calculated from the detector responses to the effluents from the various class abstractor streams. The combined collection, class-separation, and individual determination arrangement proved to be feasible during field testing, notwithstanding minor design refinements that are needed. (Author abstract modified)

59868 **APTIC NO. 82391**

Ishida, Kozo, Toshio Shimazaki, Fumio Tanei, and Taizo Yagi

INFRARED GAS ANALYZER. *(Assignee not given.) U. S. Pat. 3,898,462. 8p., Aug. 5, 1975. 3 refs. (Appl. Dec. 20, 1973, 19 claims).*

An improved non-dispersive infrared gas analyzer that is capable of simutaneously detecting and measuring several components in a gas mixture is described. A number of detectors corresponding to the number of gaseous components to be measured are provided, with each of the detectors having two chambers separated by a diaphram. Both chambers are filled with one of the gaseous substances expected to be found in the gaseous mixture. Each chamber has a window on each of its ends in the direction of energy flow from two sources of infrared energy, and each chamber is optically aligned with one of the two energy sources. The detectors are arranged in optical series along the energy path. Situated between the energy sources and the detectors and lying along the energy paths are two cells having ends which are transparent to the energy. A reference gas is placed in one of the cells, and the gas to be analyzed is introduced into the other cell. A mechanical modulator or chopper is interposed between the energy sources and the cells to interrupt intermittently the beams of energy flowing through the cells and chambers. Each detector also includes the necessary electronics to offset spurious signals resulting from interfering gases in other detectors. (Author summary modified)

59869 **APTIC NO. 83500**

Ishiguro, T

A STUDY OF THE EVALUATION OF MIXED ODORS. *(Fukugo akushu no hyoka ni kansuru kenkyu). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 13(5):1-54, Nov. 1975.*

Results of a study of the evaluation of mixed odors, undertaken in 1974 by the Japan Clean Air Association and commissioned by the Air Quality Bureau of the Japanese Environmental Agency, are given. The object was to determine and analyze the multiplication phenomena of multiple odorants. Malodor from leather processing plants, sewage treatment plants, coffee plants, animal barns, and kraft pulp plants were sampled and rendered free of ammonia and hydrogen sulfide. Then the odor samples of the three different odorants were put together in a bag and the intensity of odor and acceptability were judged by odor experts. This study will provide some basis on which to review the odor control standards for coexisting odorants. Concentrations of odorants in relation to odor intensity and odor acceptability are tabulated. The odor quality in relation to odor intensity and odor acceptability are tabulated. The results of the tests clearly indicate that the present odor standard, based on the concentration of odorants, is not meaningful for mixed odors.

59870 **APTIC NO. 83687**

Ishiguro, Tatsukichi

STUDIES ON THE EVALUATION OF COMBINED OFFENSIVE ODOR. *(Fukugo akushu no hyoka ni kansuru kenkyu). Text in Japanese. PPM (Japan), 6(12):42-59, Dec. 1975.*

The Air Quality Bureau of the Environmental Agency of Japan commissioned an Evaluation of Combined Offensive Odors study for fiscal year 1974. Odors were collected at animal processing plants (fish, animal, fowl), human waste treatment plants, food industries, livestock farms, and kraft pulp mills. The diluted test odor samples, with ammonia and hydrogen sulfide removed, were judged by perfumers for odor quality, odor intensity, and odor acceptability. Variation of the concentration of chemical components did not correspond directly to the odor intensity and odor acceptability. Combined offensive odors require modification of the presently existing odor intensity classification based on monomers. It is impossible to measure H2S contained in the combined odor.

59871 APTIC NO. 84179

Ishikawa, Kaoru, Seiichiro Yoshimoto, Noriaki Kano, Shozo Nakao, and Hiroaki Iwamoto

DETERMINATION OF SULFUR DIOXIDE, PART 3, ERRORS BY DIFFERENT LABORATORIES. *(SO2 no teiryo ni kansuru kenkyu, 3, chuwaho to arusenazo III-ho dai 2-kai kyodo jikken kekka no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):298, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 40.)*

The determination error between several different laboratories for the same sulfur dioxide samples is considered. The common SO2 gas and liquid samples were distributed and analyzed by the neutralization method and Arsenazo III method. The Arsenazo III method gave 5 to 10% higher SO2 value than the value obtained by the neutralization method. The average SO2 measurement by all laboratories by the Arsenazo III method for the 100 SO2 common gas sample was 102.27 ppm, while that by the neutralization method was 95.26 ppm. The accuracy of the Arsenazo III method was poorer than that of the neutralization method.

59872 APTIC NO. 82964

Ito, Michio, Yoshio Saiki, Etsuo Yoneyama, and Masaki Mori

INFLUENCE OF AMMONIUM ON AP METER. (CONDUCTIMETRIC SULFUR DIOXIDE ANALYZER) AND REMOVAL OF AMMONIA GAS. *(Ap meta ni oyobosu anmonia no eikyo to sono taisaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):282, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 18.)*

A study was conducted on the effect of ammonia (NH3) on an AP meter (an automatic conductimetric analyzer for sulfur dioxide) and the efficiency of countermeasures. An on-site test was conducted using AP meters, one GR and one GRH model, with oxalic acid traps, and AP meters, four GR and four GRH models, without oxalic acid traps to measure both SO2 and NH3. Indoor tests were conducted using 2 GRH models with an oxalic acid trap and 2 GRH models without an oxalic acid trap. Various reactions of SO2 and NH3 with atmospheric air had sometimes a minus, sometimes a plus effect on the SO2 analytic values. The effectiveness of the oxalic acid trap for removal of NH3 was proved.

59873 APTIC NO. 82968

Ito, Michio, Yoshio Saiki, Etsuo Yoneyama, and Masaki Mori

MEASUREMENT ERRORS OF AP METER (CONDUCTIMETRIC SULFUR DIOXIDE ANALYZER). *(AP meta no sokutei gosa no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):283, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 19.)*

The revised environmental standards of 1973 require highly precise measurement of sulfur dioxide (SO2) in Japan. The measurement errors of AP meters (conductimetric SO2 analyzers) were investigated, especially the errors of precision and accuracy in measuring low concentrations of SO2. A test was conducted using 5 AP GR-2C models and 5 GRH models, and simultaneously using four analyzers which use the p-rosaniline method to measure concentrations of SO2 for a total of 36 hours in Musashino city in Tokyo, Hara city in Chiba, and Yokohama city in Kanagawa. The precisional error was below an average of 6% of the fluctuation coefficient with all of the AP meters, while the p-rosaniline method recorded an error above 7%. However, the error of accuracy was higher among all the AP meters than with the p-rosaniline method. This was caused by an evaporation loss of the absorption solution. When the amount of the absorption solution was corrected, the corrected value of the AP meters was very close to that of the p-rosaniline method.

59874 APTIC NO. 82899

Iwamoto, Iwao, Takeshi Suitsu, and Nobuyoshi Fugono

STUDY OF PORTABLE MASS SPECTROMETER FOR AIR POLLUTION MEASUREMENT. *(Kahan gata kani shitsuryo bunseki-dei ni kansuru kenkyu). Text in Japanese. Ministry of Posts and Telecommunications, Artificial Satellite Research Div., 5p., 1975.*

The technique of quadrupole mass spectrometry, developed for the observation of the upper atmosphere aboard spacecraft, was applied to air pollution measurement. A portable, low power, easy handling mass spectrometer for nitrogen oxides, sulfur oxides, and low mass number organic compounds was built and tested. Descriptions of the mass spectrometer elements, the ionization source, and the air intake and discharge systems are given. Results of preliminary experiments indicated that pollutants on the order of 1 ppm in the atmosphere can be detected; further studies are required to improve sensitivity. Efficient data processing by computer for identification and calibration are being investigated.

59875 APTIC NO. 83199

Iwamoto, Iwao, Takeshi Suitz, and Nobuyoshi Fugono

STUDY OF PORTABLE MASS SPECTROMETER FOR AIR POLLUTION MEASUREMENT. *(Kahan gata kani shitsuryo bunseki kei ni kansuru kenkyu). Text in Japanese. In: Research Report of Ministry of Posts and Telecommunications, Radio Research Labs., Artificial Satellite Research Div., p. 1-9, 1975.*

Studies were conducted from 1972-1974 on the development of a portable quadrupole mass spectrometer for measuring air pollutants. (Nitrogen oxides, sulfur oxides, and low mass number organic compounds). The appropriate choice of an ionization source, and scanning of the mass spectrum in sections instead of all at once, are helpful in identification of pollutants present in low concentrations. When an ultraviolet photon ionizer was used to analyze automotive exhaust components, the number of peaks formed decreased, because of selective ionization, and identification of components became easier. A peak at mass number 46 appeared for nitrogen dioxide (photon ionization potential 9.73 eV). A peak at mass number 60 seemed to be the result of a secondary product from ultraviolet photon reactions. A combination of microcomputer and mass spectrography would enhance the portability of the analyzer. Analysis time for one component is expected to be about one second.

59876 APTIC NO. 76366

Jacobs, Martin I.

FACTORS AFFECTING THE MEASUREMENT OF SMOKE GENERATION BY BURNING POLYMERS. *J. Fire Flammability, 6(3):347-354, July 1975. 4 refs.*

The effects of dropping and of sample thickness on smoke measurements using the National Bureau of Standards Smoke Density Chamber were investigated. Inhibition of dropping by means of a silica filter leads to an increase in measured smoke. This higher smoke level is a better measure of a material s smoke generating capability. An empirical equation is derived which predicts smoke emissions as a function of thickness for a variety of plastics. The ability to account for the effects of dropping and of sample thickness is considered in terms of possible smoke regulations. (Author abstract modified)

59877 **APTIC NO. 83405**

Jennen, A., G. Alaerts, and G. Ronsmans

DETERMINATION OF ETHYLENE IN THE ATMOSPHERE. *(Dosage d l ethylene dans l air). Text in French. Analusis, 3(8):427-429, Oct. 1975. 4 refs.*

Ethylene can be determined in the presence of other olefins in the atmosphere by being fixed in a methanolic solution of mercury acetate as organomercury derivatives, which are then separated by thin layer chromatography and recovered with gaseous chlorhydric acid and dithizone. The adduct CH3COOHgC2H4OCH3 is then quantitatively converted into HgCl2 which is reduced by sodium borohydrate and determined by atomic absorption. The precision is estimated at 90-95% and the limit of determination is about 0.1 ppm C2H4 in the atmosphere. With this method, fluctuations in C2H4 concentration and the pollution source can be determined.

59878 **APTIC NO. 83770**

Jennings, S. G.

MEASUREMENTS OF THE NUMBER CONCENTRATION OF AITKEN NUCLEI AT MOUNTAIN AND RURAL SITES. *J. Rech. Atmospheriques, 9(2):59-66, April-June 1975. 9 refs.*

The number concentration of Aitken nuclei were measured using automated Nolan-Pollak photoelectric nucleus counters at a remote mountain site, a sparsely populated site, and in a rural environment. The nucleus counter assembly operates very satisfactorily over long periods under field conditions. The apparatus is particularly sensitive in detecting perturbations in the background count due to localized nuclei sources. Frequency distribution curves of the individual observations follow closely a log normal distribution for each measurement period. The two-minute sampling frequency of nuclei counts is increased an order of magnitude without causing a significant change in the nuclei number distribution. (Author abstract modified)

59879 **APTIC NO. 75999**

John, Walter

INVESTIGATION OF PARTICULATE MATTER MONITORING USING CONTACT ELECTRIFICATION (FINAL REPORT). *California State College, Turlock, Environmental Protection Agency Grant 802726, Program Element 1AA010, ROAP 26AAM-65, Rept. EPA-650/2-75-043, 52p., Feb. 1975. 55 refs.*

NTIS: PB 245055/AS

The theory of charging aerosol particles by contact electricity is reviewed along with the development of a monitor for particulate matter based on this principle. The dynamic response of the contact electricity monitor tracks well with that of an optical detector, and the total charge correlates well with the gravimetric mass. Humidity or precharge on the particles does not influence the detector. Particle size also does not exert an important effect on the detector response, although there is a cutoff for very small particles. The sensitivity of the instrument depends on the electrical resistivity of the particulate material and varies over a factor of 60. The surface condition of the Inconel probe used with the detector exerts a major effect on the instrument s sensitivity. Additional work on this aspect of the detector is required. Experimental measurements are presented for a variety of particulates, including fly ash and dust. (Author abstract modified)

59880 **APTIC NO. 83010**

Johns, F. B.

PORTABLE APPARATUS AND PROCEDURE FOR THE SEPARATION OF KRYPTON, XENON, AND METHANE IN AIR. *In: Noble Gases. Richard E. Stanley, A. Alan Moghissi, and Jerry J. Lorenz (eds.), p. 225-238, 1975. 2 refs. (Presented at the Noble Gases Symposium, Las Vegas, Nev., Sept. 24-28, 1973.)*

A portable apparatus and procedures are described for the rapid separation, collection, and counting of radioactive krypton, xenon, and methane in atmospheric air. The apparatus consists of a series of adsorbing and chromatographic columns. Subsequent elution of the krypton, xenon, and methane at various temperatures provides the separation. The detection of the various gases is accomplished with the use of a thermister detector circuit. The krypton, xenon, and methane are dissolved in a degassed toluene-base liquid scintillation solution after volume determination, and counted in a small commercial liquid scintillation counter. The krypton, xenon, and methane from a 1 cu m air sample can be separated in 2 to 2.5 hr with this apparatus and separation method, a time short enough so that the 76 min, 2.8 hr, and 4.4 hr half-life krypton isotopes can be detected. (Author abstract modified)

59881 **APTIC NO. 82791**

Johnson, Duane J., Robert L. Richardson, and Roger R. Wallis

ASSURING HIGH QUALITY DATA FROM AMBIENT AIR QUALITY MONITORING NETWORKS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. (Presented at the Air Pollution Control Assocation, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-10.1.)*

Quality assurance activities associated with the Texas Air Control Board s continuous monitoring network are reviewed. The quality assurance program consists of three major segments: standardization, quality control, and activity audits. A rigid system of calibration standard and data validation criteria is used to routinely screen and reject invalid data which otherwise might enter the data base. About 45-60% of the raw data survive the data validation testing program. Special attention is also given to the design of the analytical systems in the monitoring stations, especially the conditioning and routing systems for ambient, span, and zero gas samples. The overall accuracy of the TACB s air quality measurements is estimated to be about + or - 20% of which is the magnitude of the validation criteria limits set for the span and calibration values. (Author conclusions modified)

59882 **APTIC NO. 84205**

Kadowaki, Rei Ichiro Kojima, and Kazumi Koike

IMPROVEMENT OF THE MEASUREMENT METHOD OF AMMONIA IN THE OFFENSIVE ODOR CONTROL LAW. *(Akushu boshiho ni okeru anmonia sokuteiho no kento to sono kairyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):284, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 21.)*

An exposure test with sulfuric acid filter paper in ammonia gas was undertaken. Fresh sulfuric acid filter paper (55 mm diameter) was prepared and stored in a desicator before the exposure test. Ammonia gas (up to 4 ppm) was let into a 10 cu m stainless steel chamber; the filter paper was exposed, and the amount of ammonia absorbed on the filter was determined, with the exposure time. The original value of the fresh sulfuric acid filter paper was 0.3 microgram. The amount of the ammonia on the filter paper increased linearly with exposure time. The amount of the absorbed ammonia after 5 hr was 16, 25, and 48 microgram for ammonia gas concentrations of 0.96, 2.51, and 4.00 ppm, respectively. This indicated that the original ammonia value on the sulfuric acid filter papers would create problems for environmental ammonia determination unless the unexposed filter paper was kept properly before use. To eliminate this problem, a sealed holder for the sulfuric acid filter paper was constructed. With this holder, the absorption of ammonia prior to atmospheric ammonia determination could be avoided.

59883 **APTIC NO. 83375**

Kaleganov, B. A.

SUPERIORITY OF THE EXTERNAL STANDARD METHOD IN X-RAY PHASE DETERMINATION OF

QUARTZ DUST. (O preimushestve vneshnego standarta pri rentgenofaznom opredelenii kvartsa v pyli). Text in Russian. Gigiena i Sanit., no. 8:58-59, 1975. 2 refs.

Dust samples were analyzed for their quartz (alpha quartz) content by X-ray diffraction analysis, using internal and external standards. Diffractometer model URS-50IM with Geiger counter model MSTR-4, and X-ray tube BSV-6 with copper anode were used. The diffraction intensity was determined from the peak height over background level on the self-recorder tape. The comparative measurements revealed a considerably lower time requirement for the external standard method, especially when large series of samples are to be analyzed.

59884 **APTIC NO. 80812**

Kamiya, Akio and Hiroo Mizutani

DETERMINATION OF VANADIUM IN AIR BY FLAMELESS ATOMIC ABSORPTION SPECTROPHOTOMETRY. *(Furemuresu genshi kyukoho ni yoru taikichu no banajiumu no teiryo). Text in Japanese. Preprint, Japan Society of Air Pollution, Tokyo, p. 343, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

The quantitative analysis of airborne vanadium by flameless atomic absorption spectrophotometry has been successfully conducted by using the solvent extracting method to condense vanadium, a very small amount of which is contained in the air. The flameless atomic absorption photometer (AA-1 model) was connected to a flameless atomizer (FIA-1 model) to determine the vanadium content in the test air collected by a high volume air sampler. The results of the test prove that this method is superior in sensitivity to acetylene flame atomic absorption spectrophotometry and flame atomic absorption spectrophotometry, and claims a maximum detection limit (S/N is equal to 2) of 0.03 ppm. With ashing conditions of 3.75V and 50 sec, atomizing conditions of 9V and 15 sec, and velocity of argon gas flow at one l/min, the absorption rate reaches its peak, yielding a coefficient variation of 6.9% in 15 analytic tests conducted with a solution containing 1 ppm of vanadium.

59885 **APTIC NO. 76398**

Kanashov, S. N. and B. N. Ykhin

MOBILE LABORATORY FOR AIR POLLUTION MEASUREMENT. *(Peredvizhnaya laboratoriya po kontrolyu zagryaznennosti atmosfery). Text in Russian. Energetik (Moscow), no. 3:15-16, March 1975.*

A test van for air pollution monitoring around and in electrical power plants is described. The test van is equipped with the necessary instruments for the determination of dust, carbon monoxide, sulfur dioxide, nitrogen oxides, ammonia, sulfuric acid, and mercury in work-places, and for the determination of dust, SO_2, nitrogen oxides, CO, methane, and carbon dioxide around the power plant stacks. Mine interferometers with sampling hoses are used for the detection of methane in gas ducts and containers, up to 6% methane content.

59886 **APTIC NO. 73319**

Kaneko, Teruo

A GAS EXTRACTOR. *(Gasu chushutsu ki). Text in Japanese. (Fuji Electric Co., Ltd., Kawasaki (Japan)) Japan. Model Util. Sho 50-4385. 3p., Feb. 5, 1975. (Appl. Sept. 16, 1969, 1 claim).*

A simple device to extract gas sample from a chimney is described. A sleeve is attached to the chimney wall, and the sleeve encloses a pipe whose inner side is equipped with a filter bag. The pipe encloses a second pipe which is used to blow out the dusts accumulated on the filter bag by injecting compressed nitrogen or air. The end of the latter pipe has several holes and the pipe can be rotated; thus, the compressed nitrogen or air flow can be directed to all the surface of the filter bag. The flue gas sample flows out through the space between the two pipes and can be extracted from the chimney. The sleeve to the chimney wall can be removed if necessary; however, routine cleaning for dusts on the filter bag can be achieved without removing the sleeve.

59887 **APTIC NO. 83063**

Karmarkar, K. H. and G. G. Guilbault

DETECTION AND MEASUREMENT OF AROMATIC HYDROCARBONS IN THE AIR BY A COATED PIEZOELECTRIC CRYSTAL DETECTOR. *Environ. Letters, 10(3):237-246, 1975. 14 refs.*

Nujol with trans-iridium chloride (carbon monoxide) $(PPh_3)_2$ complex, was investigated as a coating for a piezoelectric crystal detector for xylenes and other aromatic hydrocarbons in air. Test gases and vapors diluted with lab air were injected into a flow system containing the crystal detector. Aromatic compounds such as xylenes, benzaldehyde, 1,3,5-trimethylbenzene, anisole, and n-butyl benzene can be detected at low concentrations. Interference from other pollutants were also studied. The device preferentially detects some aromatic hydrocarbons in air over aliphatic ones. The effect of atmospheric moisture is minimal. (Author abstract modified)

59888 **APTIC NO. 82245**

Kasahara, Michiyo, Sadaaki Harada, Hirobumi Hamada, and Hirohide Eguchi

TRACE ALDEHYDE ANALYSIS FOR WASTE GASES BY DNPH METHOD. *(DNPH ho ni yoru haikichu no biryo arudehido rui no bunseki). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 203, 1975. 2 refs. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper 1D22.)*

The trace analysis of aldehydes by gas chromatography is described. The 2,4-dinitrophenylhydrazine in 2N hydrochloric acid was used as the absorbing liquid for aldehydes, and the resulting DNPH derivatives were filtered by a millipore filter (0.01 micrometer) and dissolved into benzene, which was analyzed by gas chromatography with electron capture detector. When the benzene dissolution was done without filtration treatment, some of the unreacted DNPH was also dissolved into benzene, whose GC peak overlapped with the GC peaks of the DNPH derivatives of C1 to C3 aldehydes. However, with filtration treatment, this could be avoided, and the aldehydes could be determined from the chromatogram. In order to have the DNPH derived crystals larger than the filter size, a reaction time of 2 hr was necessary, and fresh absorbing liquid was needed. The use of glass beads coated with the absorbing liquid was also necessary in order to increase the aldehyde collection efficiency. Under these reaction conditions, the collection efficiency for formaldehyde was more than 85%, and that for other aldehydes was more than 90%.

59889 **APTIC NO. 83386**

Kasprzycki, Andrzej

COMPARISON OF AIR POLLUTION MEASUREMENT DATA WITH AIR QUALITY STANDARDS. *(Porownanie wynikow pomiarow zanieczyszczenia atmosfery z normami jakosci powietrza). Text in Polish. Ochrona Powietrza (Warsaw), 9(4):104-108, 1975. 4 refs.*

The method utilized for quantitative comparison of the results of measurement of air pollutant concentrations with established air quality standards for an arbitrary time period is described. Obtained results of measurement can produce a simple test or a time series with a defined correlation radius. There may also be a need to compare the results of measurement of atmospheric pollutants obtained in the area of their action upon people and plant life with the norms of air quality obtained at a different time through measurement averaging. It is vital to introduce quantitative criteria on the basis of which tactical decisions on air quality can be made.

59890 **APTIC NO. 82104**

Kato, Tatsuo

MEASURING METHOD BY THE OFFENSIVE ODOR SUBSTANCE DEVICE. *(Akushu busshitsu no kiki ni yoru sokuteiho). Text in Japanese. Seikatsu to Kankyo (Life Environ.), 20(11):13-27, Nov. 1975.*

Historical aspects of mechanical measurement methods for malodor are reviewed. Problems related to chemical analysis of malodor, the fundamental approach to ultra-microanalysis, the low- temperature adsorption method, the column adsorption method, reaction repletion, the gas chromatography/mass spectrometry method, extension to water analysis, and environmental problems and chemical analysis are discussed. Various mechanical measurement methods for malodor are described. The extensive, complicated, and intense contamination of modern times, and the progress in designing measuring devices are reviewed. The development and application of gas chromatography is the baseline of the technical side of malodor analysis. Chemical analysis of malodor centers on ultra-microanalysis and multi-composition analysis.

59891 **APTIC NO. 84713**

Kato, Tatsuo and Nobutsugu Nakayama

ANALYSIS OF AIR POLLUTANTS, REPORT XXVIII. *(Taiki osen no zen bunseki Dai 28 po. Enka biniru no SIM ho ni yoru kankyo benseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):315, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 57.)*

A study was conducted on the evaluation of a highly selective and sensitive analytical method for the analysis of chloroethylene, the Selective Ion Monitor Method (SIM) of gas chromatography-mass spectrometry by the Yokohama National University Environmental Science Research Center. First, the results of the investigation of polyvinyl chloride contamination in Takaoka City, Toyama Prefecture were reported. The contaminated air was sampled at 36 points in the city. After the test material was concentrated, it was analyzed by GC-MS, which revealed the formation of a contaminated area in the neighborhood of the source of polyvinyl chloride contamination, i.e., the Nihon Geon Plant. Next, the results of the investigation of the distribution of airborne chloroethylene were reported. The test material was sampled on the campus of the Yokohama National University, and processed in a 100-liter concentration device. As a result of the test, the maximum and minimum concentrations of polyvinyl chloride, 100 ppt (parts per thousand) and 2.2 ppt respectively, were detected. Also the existance of chloroethylene was determined by the use of a Multi Ion Detector (MID). According to the results of the two investigative cases, it was determined that the SIM method used for the analysis of chloroethylene was highly effective.

59892 **APTIC NO. 82940**

Kawasaki, Gunji, Isao Miyamoto, Osamu Ideguchi, and Kiyoto Kawasaki

ANALYSIS OF VANADIUM BY CARBON ROD ATOMIZER, ON THE ELIMINATION OF THE EFFECT OF COEXISTING ELEMENTS. *(Kabon rodo atomiza ni yoru V no bunseki, kyozongenso no eikyo no jyokyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):334, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 77.)*

The interference of sodium and potassium with vanadium determination by carbon rod atomizer atomic absorption spectrometry is considered. Three methods of eliminating sodium and potassium interference were considered. The simple addition of ammonium acetate to the aqueous solution did not work. The extraction of vanadium with N-benzoyl-phenylhydroxylamine into benzene was studied; however, when the organic solvent containing the vanadium compound was used as the sample solution for the AA measurement, the repeatability of the reading was very poor. The benzene was evaporated, and the residual vanadium chelate was treated with nitric acid-perchloric acid before being diluted with hydrochloric acid. With the use of this solution as the sample solution, potassium interference could be eliminated. The expected vanadium amount could be determined with the copresence of a 2000 fold concentration of potassium. With the presence of sodium, the vanadium was 11.4% lower than the expected concentration.

59893 **APTIC NO. 79993**

Kikuchi, T. and T. Goto

ON THE HYDROCARBON CONCENTRATION IN THE ATMOSPHERE IN MIYAGI PREFECTURE, PART 1; ATMOSPHERIC AROMATIC HYDROCARBON CONCENTRATION. *(Miyagi-kennai kankyotaiki chu no tanka suiso nodo ni tsuite, sono 1; taikichu hokozoku tanka suiso nodo ni tsuite). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 3:23, 1975.*

An analytical technique to determine benzene, toluene, ethyl benzene, xylene, and mesitylene by a vacuum bottle sampling-cold trap concentration-gas chromatography technique is described. Using standard gas samples, the recovery efficiency of the vacuum sampling bottle of pyrex glass was studied. The benzene and toluene could be retained in the bottle without much loss for 48 hr; however, the loss for the rest of the compounds after 48 hr was around 40%. Analysis of these compounds should be made within 24 hr of sampling. The recovery efficiency of all compounds by the cold glass beads trap was more than 90%. The technique was applied to analyze automobile exhaust gases and air samples. The sample gas was first sucked into a one liter vacuum bottle, from which the aromatic compounds were concentrated on the cold glass beads. Upon heating the trap, the aromatic compounds were measured by gas chromatography with flame ionization detector. The total aromatic hydrocarbons content in automobile exhaust gas ranged between a few ten ppm to a few hundred ppm, which was 40 to 50% of the total hydrocarbon concentration in the exhaust gas, based on the GC peak areas. The atmospheric aromatic hydrocarbons level was 0.1 to 0.01 ppm, mainly benzene, toluene, ethylbenzene, and xylene.

59894 **APTIC NO. 82362**

Kimoto, Toshio and Makoto Takahashi

DETERMINATION APPARATUS FOR SULFATES. *(Sarufeito sokuteiki ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):302, 1975. (Presented at the National Air Pollution Research Conference, 16th Niigata, Nov. 5-7, 1975, Paper 44.)*

A sulfate analyzer developed by the Kimoto Electronic Industrial Co., Ltd. is described. The analyzer collected gas samples on a teflon roll tape with 40 mm width at a flow rate of 10 l/min. The determination of total sulfate collected on the tape was by hydrogen flame ionization detector, after heating the tape.

59895 **APTIC NO. 84181**

Kimoto, Toshio and Makoto Sakauchi

COMPARISON OF SO2 MEASUREMENTS BETWEEN CONDUCTIVITY AND FPD METHODS. *(Yoeki dendoho to FPD ho ni yoru SO2 sokuteichi no detasa ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):299, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 41.)*

A comparison between a flame photometry detector and the solution conductivity method for sulfur dioxide measurement is described. Although both methods have same detection limit (5 ppb SO2), the response time is faster with the FPD method. The response time by the FPD method is within 30 sec, but that by the conductivity method is within 2 min. The former method can be interfaced with gas chromatography, but the latter cannot. Ammonia and carbon dioxide are interferers for the conductivity method, hydrogen sulfide and carbon dioxide for the FPD method.

59896 **APTIC NO. 82920**

Kimura, Kikuji

SEVERAL KINDS OF FILTERS FOR DETERMINATION OF AIRBORNE PARTICULATES, PART 1. *(Ryujobutsu no sokuteiyo roso no kento, dai 1-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):355, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 101.)*

The effect of humidity and heat on the filter weight was studied. The filters examined were glass fiber filters, membrane filters, silver membrane filters, and filter papers. A glass filter weighing around 115 mg was exposed to various relative humidities for one day, then transferred to a weighing room (relative humidity of 50 to 60%) for the weight measurement. The weight of glass filters continuously decreased in the weighing room after the filters were brought in, reaching a constant weight after 30 to 60 min. This was not true for silver membrane filters; their weight did not change in the weighing room. The weight change for the glass fiber filters after 30 to 60 min in the weighing room was less than 0.15 mg from the weight of the fresh filters, regardless of exposure to humidities up to more than 90%.

59897 **APTIC NO. 79717**

Kirsch, K. J. and M. K. Mazumder

AEROSOL SIZE SPECTRUM ANALYSIS USING RELAXATION TIME MEASUREMENT. *Appl. Phys. Letters, 26(4):193-195, Feb. 15, 1975. 8 refs.*

The use of relaxation time measurements for aerosol size spectrum analysis is described. The particle relaxation time is determined from the ratio of the velocity amplitude of an aerosol particle to the velocity amplitude of the medium while the aerosol is subjected to acoustic excitation of a known frequency. A differential laser Doppler velocimeter is used to measure the particle velocity amplitude, and a microphone is used to measure the velocity amplitude of the medium. The aerodynamic diameter of the particle can be determined from the particle relaxation time if the particle density is known The method can be applied to real-time in situ measurements of size distributions of aerosols containing both solid particles and liquid droplets in the range of 0.1-10.0 micron in diameter. (Author abstract modified)

59898 **APTIC NO. 84060**

Kisler, S. and B. S. Fiskin

MEASUREMENT UNITS FOR MONITORING THE CONCENTRATIONS OF HARMFUL EMISSIONS BY TECHNOLOGICAL AGGREGATES OF BLACK METALLURGY IN GASES AND WASTE WATER. *(Messgeraete zur Konzentrationskontrolle von schaedlichen Auswuerfen technologischer Aggregate der Schwarzmetallurgie in Gasen und Abwaessern). Text in German. Neue Huette, 20(12):727-731, Dec. 1975.*

Equipment based on optical, electrostatic, and radionuclide techniques is in use for continuous automatic determination of dust concentrations in gases. For the determination of particulate solids in waste water, continuous and discontinuous methods are discussed along with a suggestion for sampling and scrubbing humid dust-laden gases in a system of low inertness employing a venturi tube. For discontinuous rapid determination of mechanical impurities in dust-laden gas currents, complete separation of dust particles by water drop method is suggested with subsequent water separation and measurement of water impurities using gravitational or photoelectric methods.

59899 **APTIC NO. 83259**

Kitajima, Kazuo and Katsumi Yasui

A CONSIDERATION ON THE COLLECTING FILTER SELECTION OF THE ATMOSPHERIC PARTICLE SUBSTANCE ANALYSIS AND ON ANALYTICAL METHOD. *(Taikichu ryushijo busshitsu no seibun bunseki ni tekishita hoshu firuta no sentei to bunsekiho no ichi kosatsu). Text in Japanese. Kansai Denryoku Soken Hokoku (Rep. Inst. Kansai Electr. Power Co., Inc.), no. 16:182-186, Sept. 1975.*

An X-ray microanalyzer (EMX) for assessment of the behaviors of metal compositions contained in airborne particulate substances is described. It can determine the shape, distribution, and compositions of the particles, and conduct quantitative analysis of each composition by atomic absorption spectrometry. The analytic technology for airborne particulate substances is established by a selection of a proper sampling filter and by the result of the evaluation study for the suitability of the EMX. The results of the evaluation study of EMX indicate that EMX analysis reveals contaminating elements immediately, assesses the shape of particle and distribution of elements, assesses the coexisting elements during the analyzing process, and is useful for detection of sources of the particles if sampling is combined with meteorological observation.

59900 **APTIC NO. 82905**

Kitase, Masaru, Eiichi Ito, Tetsuo Sakai, and Tetsuji Miyamoto

DETERMINATION OF VANADIUM IN ATMOSPHERE BY S. W. POLAROGRAPHY. *(Kukeiha poraro guraphi ni yoru taikichu banajiumu no teiryo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):342, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 87.)*

An analytical method for vanadium determination by square wave polarography was studied, using masking agents. The half-wave potential of vanadium was -1.28 V and -1.10 V, compared to a mercury pool at pH 2.2 and 9.6, respectively. The separation of vanadium from lead tended to be better in alkaline solutions; however, iron aluminum precipitated in such solutions. A 20 ml solution of vanadium (0.5 to 2.5 ppm) was prepared with 2 ml 5 M ammonium chloride, 2 ml 5 M sodium acetate, and 1 M ethylenediamine tetraacetic acid (disodium salt). The half-wave potential of vanadium of this solution was -1.22 V, with interference from the half-wave potentials of lead and cadmium. Cadmium up to 10 ppm did not interfere with the vanadium measurement. Up to 200 ppm iron and aluminum and 20 ppm copper, zinc, and manganese did not interfere with the vanadium determination. When 1,2 diaminocyclohexane tetraacetic acid was used as the masking agent in addition to EDTA, the half-wave potential of lead shifted to -1.47 V and the lead interference with the vanadium determination could be eliminated.

59901 **APTIC NO. 83300**

Klockow, Dieter, Helmut Denzinger, and Gerhard Roenicke

APPLICATION OF SUB-STOICHIOMETRIC ISOTOPE DILUTION ANALYSIS FOR THE DETERMINATION OF ATMOSPHERIC SULFATE AND CHLORIDE IN BACKGROUND AIR. *(Anwendung der substoechiometrischen Isotopenverduennungsanalyse auf die Bestimmung von atmosphaerischem Sulfat und Chlroid in Background-Luft). Text in German. Chem.-Ing.-Tech., 46(19):831, 1975. (The full length text can be obtained from: Verlag Chemie GmbH, D-6940 Weinheim, Postfach 1260, West Germany).*

Substoichiometric isotope dilution analysis for the determination of atmospheric sulfate and chloride in precipitation is described. The sample to be analyzed is combined with an ammoniacal solution of 35S-labeled barium sulfate with edetic acid and ethanol, and is slightly acidulated. Thus, barium sulfate obtained in a quantity equivalent to that of the barium ions, is slowly precipitated. After centrifugation, the total sulfur content (including sulfite and sulfide sulfur) is measured in a liquid scintillation counter. The sensitivity amounts to 40 nanograms/ml, which can be reduced to 5 nanograms/ml by the use of a special evaporation technique. Apart from a negligible interference of barium and strontium, there are practically no interferences. The technique can also be used to determine trace quantities of chloride at a sensitivity of 400 nanograms/ml, by using a 36Cl-labelled ammoniacal solution of silver chloride. Simultaneous determination of sulfate and chloride is possible by use of a double-labeled reagent solution consisting of edetic acid, ammonia, Ba35SO4 and Ag36Cl.

59902 **APTIC NO. 84031**

Klyuchininkas, A. Y. and P. B. Balternas

VOLUMETRIC INSTRUMENT FOR AIR POLLUTION MEASUREMENT. *(Kontrol zagryazneniya vozdukha emkostnym priborom). Text in Russian. Energ. Elektrif., no. 5:40-41, 1975.*

A capacitive method for the automatic measurement of the concentration of dielectric dust in waste gases is described along with the theoretical basis of the measurement. The presence of particulate matter in the gas between the plates of a capacitor changes the force and direction of the electric field, which can be used for the measurement of the dust concentration in the knowledge of its electrical and magnetic parameters. The method is universal as the charges of the dust particles do not influence the capacity of the capacitor.

59903 **APTIC NO. 79999**

Kobayashi, M.

YOKOKAWA VCM MONITORING SYSTEM. *(Yokokawa VCM monitaringu sisutemu). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 15(8):9, Aug. 1975.*

A monitoring system for vinyl chloride monomer in working environments that was developed by the Yokokawa Electric Manufacturing Co. is described. The measurement method is gas chromatography, and the system is equipped with 12 gas flow channels which are controlled by an electric flow channel controller. Therefore, the working environment at a maximum of 12 different locations in a factory can be monitored intermittently. The system can analyze the vinyl chloride level at a particular location as a ten minute average value by sampling air for 10 min; therefore the quality of one working environment can be monitored very 2 hr if all 12 channels are busy monitoring 12 different environments and a 10 min average is desired. The minimum time requirement for a single sample analysis is 5 min, and the determination range for vinyl chloride monomer is up to 10 ppm with a detection limit of 0.05 ppm. The recorder of the monitoring system can record the analytical data separately for each gas flow channel, and can give the data as a chromatogram, a histogram, or an intermittent plotting.

59904 **APTIC NO. 82908**

Kobayashi, Yoshitaka, Tokihito Yoneda, Sadamu Iwasaki, and Tetsuzo Kitagawa

DETECTION OF ACID AEROSOL BY DETECTOR PLATE. *(Kenchiban ni yoru sansei earozoru no kenchi). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):360, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 106.)*

An acid aerosol detection plate is described. The detection plate was prepared by coating phenyl azonaphtylamine dissolved in a polyvinyl alcohol-dimethyl formaldehyde solution on an acryl plate, and drying the plate. The plate gives a red-purple color with sulfuric acid mist; however, the color change occurs only for solutions with pH less than 4. No color change occurs with atmospheric level sulfur dioxide and nitrogen dioxide. After a plate was left for 2 hr near a main highway, microscopic observation showed colored spots, with the largest spot 30 micron in diameter. A similar experiment was made at a business district by loading a plate on a cascade impactor, into which about 100 l air was sucked; colored spots were observed. The detection plate is suitable for the qualitative analysis of aerosol acids; the color changes persisted for several hours.

59905 **APTIC NO. 84213**

Kobayashi, Yoshitaka, Masahiro Hori, and Akira Iino

MEASUREMENT OF TRACE FLUORIDE IN ATMOSPHERE BY THE ALKALINE FILTER PAPER METHOD. *(Arukair roshiho ni yoru taikichu fukka butsu no sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):304, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 46.)*

An analytical technique for gaseous fluorides by the alkali filter method with the lanthanum alizanine complex method was studied. A filter paper was pre-treated with 30% potassium carbonate solution, on which fluoride was collected. The fluoride collected on the filter paper was heat-extracted with water and the measurement was done using the lanthanum-alizanine complex method. A linear fluoride calibration curve was obtained up to 2.0 microgram fluoride/ml from the pH 5 solution. No interference with the absorbance was observed for potassium ion, carbonate ion, chloride ion, nitrite ion, ferric oxide, or aluminum oxide. However, the presence of sulfate ion produced a suspension in the solution which increased the absorbance measured. This sulfate ion interference could be eliminated if the suspending compounds were removed by a centrifugal separation before the measurement of the absorbance. The technique was applied to measure the fluoride pollution in an industrial area. The filter paper was exposed for 1 month in the atmosphere, and the fluoride level was determined. Up to 20 microgram fluoride/day/100 sq cm was detected from the air. This analytical result agreed with the result obtained by a conventional method which was also used to measure the fluoride pollution at the area.

59906 **APTIC NO. 84128**

Koehler, K.

MEASUREMENT AND RECORDING OF POLLUTANTS, OFF-GAS QUANTITIES AND TEMPERATURES IN PROCESS STACKS. *(Messung und Registrierung von Schadstoffen, Abgasmengen und Temperaturesn in Prozessschornsteinen). Text in German. Gesundh.-Ingr., 96(10):264-272, 1975. 16 refs. (Presented at the 3rd Symposium on Branch Specific Emissions, Emissions by Oil Refineries and Petrochemical Plants. Bayerische Landesamt fuer Umweltschutz, Munich, Federal Republic of Germany, March 20-21, 1975.)*

Methods of determination of sulfur dioxide emission from plant stacks were described. They are differentiated into direct and indirect measurements. The former are performed by measuring SO2 concentrations and flue gas quantities with an integrating dynamic pressure element (based on Prandl s pressure tube) and by continuously registering the measured values. Both methods indicate the absolute SO2 emission at a given time. In the latter method, concerning steam boilers, SO2 emission can be calculated from the specific waste gas volume and the consumed fuel quantity. Sulfur dioxide concentration can be measured by discontinuously working chemical analytic methods and continuously registering physical measuring instruments. Permanent control of SO2 concentrations was carried out by tested, automatically recording gas analyzers based on the principle of radiation absorption in the ultra-red range and the principle of electrical conductivity modification of a reactive solution. For the recording of SO2, oxygen and carbon dioxide and waste gas quantities, double-line recorders and dotted-line or continuous line recorders should be used. Experience demonstrates that these measuring devices for SO2 in flue gas are sufficiently accurate if they are well maintained.

59907 APTIC NO. 82517

Kondo, H., H. Kitamura, M. Kono, S. Suzue, K. Murakami, and C. Ohno

TRAPPING AND ANALYSIS METHODS OF PHTHALIC ACIDS IN ATMOSPHERE. *(Taikichu no futarusan esuterurui no hoshu oyobi sono bunseki hoho ni tsuite). Text in Japanese. Shikoku Koshueisei Gakkai Zasshi (J. Shikoku Soc. Public Health), 20(1):88-91, Feb. 1975. 12 refs.*

Hundreds of thousands of tons of phthalic acids are produced in Japan, mainly as plasticizers. There are reports of their harmful effect on human health. At the Tokushima Prefectural Pollution Control Center, trapping and analysis methods for PAE were studied. A U-shaped tube (A) was filled with DBP standard solution, which was put into a mantle heater. Tube A was connected with a glass tube (B) for dehydration, and U-shaped tubes C and D, first cleaned with ethanol, were then filled with bulking agent (60-80 mesh) and activated at 200 C for approximately 12 hr. These C and D tubes were then connected with a flow meter. Tubes B, C and D were cooled with ice and salt. Tube A was filled with 2135 microgram of CBP, heated to approximately 400 C, and aerated with a vacuum pump at 35 l/min velocity for 3 hr. When 2 g of bulking agent was used for C, it was not enough; with more than 5 g, satisfactory trapping was observed. Extraction of PAE from the activated bulking agent was then done, using n-hexane, ether, and ethanol as extraction solvents; ethanol was most effective. Extraction repeated twice served the purpose, with only 5-15 min extraction time; if over 15 min, efficiency decreased. The ethanol used for extraction was murky; it was cleaned up by reextraction with n-hexane. A recovery test was conducted using the same device used for trapping. With gas chromatography, PAE in the atmosphere could be measured.

59908 APTIC NO. 83114

Konoplev, Y. I., E. F. Shkatov, and O. L. Shcherbakova

GAS ANALYZER FOR SULFUR COMPOUNDS. *(Gazoanalizator sernistykh soedineniy). Text in Russian. Mekh. Avtomat. Proizvod., vol. 3:27, 1975.*

An award-winning gas analyzer used to control the content of gaseous sulfur oxides in the atmosphere of industrial plants is described. The apparatus demonstrates sufficient accuracy of measurement in relatively high temperatures. The basic measuring device of the gas analyzer is an electrochemical element with a solid electrolyte. The gas analyzer is designed to operate in atmospheric temperatures from 10 to 20 C and in relative humidity of not more than 70%. Its electrochemical element functions at temperatures of 0 to 350 C. For normal operations, the apparatus requires air pressure of not less than 1.8 kg/sq cm.

59909 APTIC NO. 84282

Kosmowski, Alfred

RADIOMETRIC MEASUREMENT OF ATMOSPHERIC DUST AND OF DUST EMISSION. *(Radiometrische Luftstaubmessung von Emissionen und Immissionen). Text in German. Chem. Tech., 4(5):189-191, May 1975. 1 ref.*

Radiometric atmospheric continuous dust measurement for particles with diameters less than 10 micrometer are discussed. The measuring principle is based on the partial absorption of beta-rays by atmospheric dust accumulated on a filter. This quasimetric measurement yielded values independent of chemical composition, grain size, temperature, shape, and color of particles. The dust monitor is composed of a chimney, a sampling probe, a primary instrument, indicator, and recorder, a pump aggregate, air control, and air filter. Dust emissions are calculated from dust concentrations (mg/cu m) related to emission speed and chimney cross section. Atmospheric dust measurements of 0.005-11 mg/cu m of air are possible. Removal of lung- penetrating fine dust required the instrument to be equipped with a coarse-dust separating cyclone.

59910 APTIC NO. 82459

Kravchenko, T. I. and G. A. Chemer

DETERMINATION OF ACRYLIC ACID BUTYLESTER IN THE AIR BY THIN-LAYER CHROMATOGRAPHY. *(Opredelenie butilovogo efira akrilovoy kisloty v vozdukhe metodom tonkosloynoy khromatografii). Text in Russian. Gigiena i Sanit., no. 3:78-80, 1975. 7 refs.*

Thin-layer chromatography for the determination of butylacrylate in the air is described. Butylacrylate is absorbed in mercury acetate in methanol (1 : 20) in series-connected absorbers. After concentration by vacuum evaporation, the sample is applied on alumina layer for determination. Visualization is done with diphenylthiocarbazone in carbon tetrachloride. At a recovery rate of 93%, the error is less than 10%.

59911 APTIC NO. 80156

Kretzschmar, J. G.

COMPARISON BETWEEN THREE DIFFERENT METHODS FOR THE ESTIMATION OF THE TOTAL SUSPENDED MATTER IN URBAN AIR. *Atmos. Environ., 9(10):931-934, Oct. 1975. 15 refs.*

The average daily aerosol concentration in Antwerp, Belgium was measured during two consecutive winter months with an integrating nephelometer, by the reflectometric method, and gravimetrically after collection on cellulose filters. A linear regression analysis shows that the three methods give significantly correlated results. The applicability of an integrating nephelometer to the estimation of average dust concentrations in urban areas is confirmed. (Author abstract modified)

59912 APTIC NO. 84038

Kubo, Uichi, Seiichiro Nakanishi, and Mitsuo Takaoka

FUNDAMENTAL STUDIES ON AIR POLLUTION DETERMINATION BY LASER. II. *(Reza ni yoru taikiosen sokutei no kiso kenkyu. II). Text in Japanese. Kinki Daigaku Kogai Kenkyusho Kenkyu Hokoku (Kinki Univ. Pollut. Res. Inst., Rep.), no. 3:89-94, Oct. 1975.*

The Electrical Engineering Department of the college of Engineering Science of Kinki University reports the result of a study on air pollution determination by laser beam (Lidar; light detection and ranging). The development of the laser made it possible to achieve high efficiency in air pollution analysis, however it is very expensive. The study was basically concentrated on reduction of size, simplification in handling and reduction in price; in short, the study was made to produce a popular model instrument. In order to pursue this objective the characteristics of laser beam air transmission was investigated from the basics, and the main concern was the relationship between the meteorological conditions and the value of air pollution measured, and the credibility of the empirical formula which expresses the relation between the laser beam air transmission rate and the visual range. The relation of the transmission rate and the visual range explained by M. Bertolotti was confirmed. Also the transmission distance of a 110 beam transmission rate during 1200 to 1800 hr reached a minimum of 60% with wind direction SW and SSW, and a maximum of 96% from 0000 to 0600 hours with wind direction E and NE.

59913 APTIC NO. 80935

Kubono, Ryuichi and Hiroyoshi Morita

MEASURING METHOD AND APPLIED EXAMPLES OF HYDROGEN FLUORIDE AND HYDROGEN CHLORIDE GASES. *(Fukka suiso gasu, enkasuiso gasu no sokuteiho to oyorei). Text in Japanese. PPM (Japan), 6(11):67-78, 1975. 3 refs.*

Analytic methods for hydrogen fluoride gas from industries such as aluminum refineries, superphosphate manufacturers, ceramic industries and steel industries, and for hydrogen chloride gas from waste incineration plants, amino-acid plants, polyvinyl chloride manufacturers, metal pickling plants, and general chemical plants are reviewed. The prevalent Lanthanium-Alizarine Complexion method (ALC method) and ion electrode method for hydrogen fluoride, and various chemical analytic methods and continuous analytic methods for hydrogen chloride are discussed. An automatic analyzer for monitoring concentrations of hydrogen fluoride, model GNE-21 of the Denki Keiki Co., Ltd., is introduced and its design structure and performance are discussed. A continuous analyzer for hydrogen chloride, model GSF-11, by the same company is introduced, and its analytic principle, design structure, analytic conditions, and the volume measured as compared to the volume measured by chemical analytic methods are discussed.

59914 **APTIC NO. 83142**

Kubota, Masahiko, Masashi Sakaki, Yukisato Omoto, and Yoshinori Kurata

STUDIES ON ALKALINE FILTER PAPER METHOD AND LEAD DIOXIDE CYLINDER METHOD FOR MEASUREMENT OF AIR POLLUTANTS. *(Nisankanamari ho oyobi arukari roshi ho no jakkan no kosatsu). Text in Japanese. Hiroshima-ken Eisei Kenkyusho Kogai Kenkyusho Kenkyu Hokoku (Bull. Lab. Pub. Health Hiroshima Pref. and Hiroshima Pref. Inst. Environ. Sci.), vol. 1975:42-46, March 1975. 12 refs.*

The lead dioxide cylinder method developed by the Building Research Station of England is inexpensive and simple, but the quality of the lead dioxide influences the measured value, and the sampling efficiency is variable due to meteorological factors such as temperature, humidity and the velocity of wind. The alkaline filter paper method developed by Mr. Shozo Fukui and his group can measure acidic gas such as nitric oxide and is useful to supplement the automatic analyzers. Polluting oxides were measured using the lead dioxide method, the alkaline filter paper method, a sulfur oxides automatic conductimetric analyzer, and a nitrogen oxide automatic analyzer using the Saltzman method. The values for sulfur oxides measured by the lead dioxide method and the alkaline filter paper method were closely correlated; the relation between sulfur oxides values obtained by conductimetric analysis and by the lead dioxide method was different during the summer months from the relation observed during the rest of the year. The measured value of nitric oxide by the Saltzman method and the alkaline paper filter method showed a close correlation.

59915 **APTIC NO. 82717**

Kunkel, K. E., E. W. Eloranta, and J. A. Weinman

VISUALIZATION OF EDDIES IN THE PLANETARY BOUNDARY LAYER BY MEANS OF LIDAR. *Preprint, Wisconsin Univ., Madison, Dept. of Meteorology, 3p., 1975. 4 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

The visualization of eddies in the planetary boundary layer by means of lidar is reported. Pictures of aerosol distribution in the atmospheric boundary layer were obtained with a lidar system having scanning capability. The lidar contained a ruby laser rod and operated at a wavelength of 694.3 nm. The receiver optics consisted of an 8-inch Newtonian reflector. The scanning and firing azimuth was from 0.1-90.0 deg. Pictures were taken under clear conditions with no visible haze. The height of the morning inversion and its change with time, the wind field, and images of the structure of clear air convection were obtained from the pictures.

59916 **APTIC NO. 83830**

Kurose, H.

OFFENSIVE ODOR DETECTOR. *(Akushu Kenchiki). Text in Japanese. Ohita Kogyo Daigaku Kogai Kenkyushoho (Rep. Environ. Sci. Tech. Lab., Ohita Inst. of Tech.), no. 1:39-44, Oct. 1975.*

There is no analytic method to measure malodors which can express odors in terms of ppm. Therefore an effort was made by the Environmental Science Technical Laboratory of Ohita Institute of Technology to investigate and develop an odor detector. The Institute has introduced the theory and device for an offensive odor detector called Olfactometer which is still in experimental stage. Odor molecules are named olfactions (based on the quantum mechanics), and the structure of the olfactometer is based on the theory of the contact potential difference. In this theory, the odor molecules are divided into electrolytic and non- electrolytic types. The olfactometer measures the electrolytic odor molecules as a variation of electrochemical energy, and the non-electrolytic odor molecules as a variation of internal energy in an aqueous solution. Although the measuring data are not satisfactory, some electro-olfactograms have been made for various malodors.

59917 **APTIC NO. 82267**

Kuwada, Kazuhiro, Yoshiaki Yamazaki, Yasuharu Eguchi, Michiko Uwabori, and Ken Matsuo

DETERMINATION OF STYRENE IN WASTE GASES AND AMBIENT AIR. *(Haigasu oyobi kankyo kukichu no suchiren no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution, 10(4):318, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 60.)*

An analytical technique for ppm and ppb levels of styrene in waste gases and ambient air is described. The sampling is by a plastic bag. For styrene levels greater than 5 ppm, 5 ml of the collected sample air was directly determined by gas chromatography without any concentration step. For styrene levels between 20 ppb to 5 ppm, 116 ml of the collected sample was concentrated onto a TENAX column at room temperature, from which the GC analysis was made. The GC was with a 20% PEG 20M column at 115 C with nitrogen carrier gas at 60 ml/min.

59918 **APTIC NO. 82650**

Lancour, James B. and Victor W. Hanson

GLASS FURNACE EMISSION TESTING FOR CONDENSABLE BATCH MATERIALS AND TRACE METALS. *Preprint, Toledo Univ., Toledo, Ohio and George D. Clayton and Associates, Inc., Southfield, Mich., 26p., 1975. 11 refs. (Presented at the Engineering Foundation Conference, Evaluation of Air Pollution Emissions of Stationary Sources, Pacific Grove, Calif., March 31-April 4, 1975.)*

Sampling and analytical methods that can be used to determine filterable and total fractions of boron, chlorides, fluorides, sulfur oxides, and trace metals in emissions from glass melting furnaces are reviewed. Considerations dealing with the selection of materials for nozzle and probe construction, the selection of filter media, probe decomposition and chemical corrosion, and the formation of glass deposits on the sampling nozzle under various environmental conditions are discussed. Analytical methods reviewed include: atomic absorption spectrometry, chemical methods, spectrophotometric methods, gravimetric procedures, emission spectrometry, flame photometry, and X-ray methods.

59919 **APTIC NO. 76317**

Lang, C. J., R. S. Saltzman, and G. G. DeHaas

MONITORING VOLATILE SULFUR COMPOUNDS IN KRAFT AND SULFITE MILLS. *TAPPI, 58(1):88-93, Oct. 1975. 10 refs. (Presented at the Technical Association of the Pulp and Paper Industry Environmental Conference, Denver, Colo., May 14-16, 1975.)*

An analyzer system for recording sulfur dioxide and total reducible sulfur (TRS) compounds was developed and tested extensively in several mill operations. The TRS compounds were thermally oxidized and measured as sulfur dioxide. Vital parts of the system, such as the sampling arrangement, a quartz furnace converter, and a split beam photometric detector, are described. Sulfur dioxide and TRS concentrations were measured on a 0-50 ppm scale with an accuracy of + or - 1 ppm. With the newest technique, TRS can be monitored within 1 ppm in the presence of up to 250 ppm of SO2. (Author abstract modified)

59920 **APTIC NO. 80005**

Lao, R. C., R. S. Thomas, and J. L. Monkman

COMPUTERIZED GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN ENVIRONMENTAL SAMPLES. *J. Chromatog., vol. 112:681-700, Oct. 29, 1975. 18 refs.*

Polycyclic aromatic hydrocarbons (PAH) in environmental samples were determined by preliminary separation of PAH by solvent and/or column chromatography, identification by a combination of gas chromatography with quadrupole mass spectrometry and a computer, and measurement by computerized gas chromatography using internal standards. Samples of industrial effluents, coke oven emissions, coal tar, and airborne particulates have been investigated. The efficiencies of different gas chromatographic columns were evaluated. (Author abstract modified)

59921 **APTIC NO. 82608**

Lao, R. C., R. S. Thomas, and J. L. Monkman

IMPROVED METHODS FOR SAMPLING AND ANALYSIS OF VINYL CHLORIDE. *Preprint, Environmental Protection Service, Ottawa (Ontario), Chemistry Div., 20p., 1975. (Presented at the AIHA Conference, Minneapolis, Minn., June 1-6, 1975.)*

Methods for the sampling and analysis of vinyl chloride were investigated. Recovery data for the carbon disulfide extraction of vinyl chloride monomer from activated carbon revealed that recoveries in excess of 90% are possible for samples containing more than 10 nanograms of vinyl chloride. A gas chromatographic-mass spectrometric method with background subtraction capacity was the preferred analytical method for definitive identification. A simple uncoated stationary phase provided the most stable, reproducible, and reliable analytical gas chromatographic column. An examination of fabricated products for domestic use demonstrated that the calendering, milling, and extruding processes do not drive off the total vinyl chloride monomer from the stocks. (Author conclusions modified)

59922 **APTIC NO. 82625**

Latham, J.

ATMOSPHERIC AEROSOL RESEARCH. *Manchester Univ., Manchester (England), Physics Dept., Army Contract DA-ERO-124-74-G0032, 16p., May 1975.*

Experiments dealing with aerosol dispersion and short term variations in nucleus concentration are reported. Values of the geometric mean and the geometric standard deviation for distributions of nucleus concentrations measured over different time intervals give distributions which approximate very closely a log-normal distribution. A relatively small number of measurements of nucleus concentration appears sufficient to give a distribution which is probably log-normal. Measurements taken over a period of a few days can be presented in a cumulative distribution form or by performing a frequency analysis of the data. Studies of short term (2-minute) fluctuations in aerosol particle concentration over a 3-hour period indicate that more than 50% of the readings are within 10% of the mean value of the nucleus concentration over the 3-hour period. However, fluctuations in aerosol particle concentration of the order of 100% sometimes occur within a matter of minutes.

59923 **APTIC NO. 84464**

LeBel, Peter J., Robert A. Lamontagne, and Harold W. Goldstein

THE MEASUREMENT OF CARBON MONOXIDE AND METHANE IN THE NATIONAL CAPITAL AIR QUALITY CONTROL REGION. I. MEASUREMENT SYSTEMS. *Preprint, 5p., 1975. 5 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 1975.)*

A procedure for the measurement of carbon monoxide and methane in the national capital Air Quality Control region is described. The experiment was designed to test the ability of the correlation interferometer sensor, mounted on board a helicopter, to make meaningful remote measurements in an urban area. Corroborative measurements were made including: atmospheric column density measurements at a ground truth site using a van mounted infrared fourier spectrometer; continuous ground level chromatographic analysis of atmospheric grab samples collected at various ground locations as well as from an aircraft. The various instruments and data collection techniques are described. (Author summary modified)

59924 **APTIC NO. 83495**

Liberti, Arnaldo

MODERN METHODS FOR AIR POLLUTION MONITORING. *Pure Appl. Chem., 44(3);519-534, 1975. 16 refs.*

The monitoring of basic pollutants (sulfur oxides, nitrogen oxides, carbon monoxide, oxidants, hydrocarbons, and particulate matter) to determine the air quality of a certain area is described. Specific methods for monitoring sulfur oxides include: acidimetry, conductimetry, colorimetry, potentiometry and coulometry, and flame photometry. Nitrogen oxides are measured using colorimetry, coulometry, chemiluminescence, and fluorescence. Oxidants are monitored using colorimetry, electrochemistry, chemiluminescence, and ultraviolet photometry. Methods for monitoring CO include: titrimetry, colorimetry, non-dispersive infrared analysis, catalytic analysis, electrolysis, and gas chromatography. Hydrocarbons are measured by hydrogen flame ionization detector, while some fluorides are determined by the classical colorimetric procedure. Mass measurements of particulates are made by weighing. The performance of air monitoring by static, mechanized, or automatic devices in point sensors and by remote and long path sensors is discussed. (Author abstract modified)

59925 **APTIC NO. 84405**

Licata, Anthony, Abraham J. Kurtz, and Roy S. Egdall

POSSIBLE ERRORS AND UNCERTAINTIES IN CORRECTING EMISSION DATA TO SELECTED CONDITIONS. *Preprint, Air Pollution Control Association, Pittsburgh, Pa., 30p., 1975. 6 refs. (Presented at the Air Pollution Control Association Mobile Sources Session on Air Pollution Measurement Uncertainty, New Orleans, La., Oct. 27-28, 1975.)*

The problems encountered in correcting measured emissions from stationary sources are presented. The correction factors fall into four categories: oxygen, carbon dioxide, excess air, and total air. Emission concentrations are measured as gr/SCF, lb/1000 lb flue gas, and lb/MMBTU heat input. Examples are presented of the various common bases that are used by regulatory agencies. Historical development of some of these standards are discussed and their relevence to present day operations examined.

59926 **APTIC NO. 76188**

Liu, Benjamin H.

PROCEEDINGS SYMPOSIUM ON FINE PARTICLES MINNEAPOLIS, MINNESOTA, MAY 1975. *Minnesota Univ., Minneapolis, Particle Technology Lab., Environmental Protection Agency Grant R-803556-01, ROAP 21ADL-034, Program Element 1AB012, Rept. EPA-600/2-75-059, 828p., Oct. 1975. 966 refs.*

Technical papers from the Symposium on Fine Particles are presented. They comprise a comprehensive review of the state of the art and recent developments in instrumentation and experimental techniques for aerosol studies with a focus on fine particles below about 3.5 micron diameter. Topics covered include European aerosol studies, research and development in Japan on fine particles, standardization and calibration of aerosol instruments, the generation of aerosols of fine particles, generation of monodisperse submicron aerosols by ablation from transpiration- cooled porous matrices, generation of monodisperse aerosols of 67-Ga-labelled aluminosilicate and 198-Au-labelled gold spheres, aerosol generation for industrial research and product testing, aerosol generation using fluidized beds, large flow rate redispersion aerosol generator, generation of inorganic aerosols for weather modification experimentation, generation of aerosols by bursting of single bubbles, investigation of an exploding wire aerosol, aerosol particle formation from photooxidation of sulfur dioxide vapor in air, size-selective sampling for inhalation hazard evaluations, dichotomous virtual impactors for large scale monitoring of airborne particulate matter, design, performance and applications of spiral duct aerosol centrifuges, problems in stack sampling and measurement, inertial impactors theory, design and use, cylindrical aerosol centrifuges, methods for determination of aerosol properties, aerosol mass measurement using piezoelectric crystal sensors, measurements of aerosol optical parameters, atmospheric particulate mass measurement via the beta attentuation technique, detection of ultra-fine particles by means of a continuous flux consideration nucleus counter, electrical measurement of aerosols, recent developments regarding the use of a flame ionization detector as an aerosol monitor, contact electrification applied to particulate matter monitoring, open cavity laser active scattering particle spectrometry from 0.05 to 5 micron, single particle optical counter, comparison of impaction, centrifugal separation and electron microscopy for sizing cigarette smoke, extended electrical mobility method for measuring aerosol particle size and concentration, rapid measurement of particulate size distribution in the atmosphere, identification and measurement of particulate transport properties, optical aerosol size spectrometry below and above the wavelength of light.

59927 **APTIC NO. 79772**

Logsdon, Oliver John, II and Mark J. Carter

COMPARISON OF MANUAL AND AUTOMATED ANALYSIS METHODS FOR SULFUR DIOXIDE IN MANUALLY IMPINGED AMBIENT AIR SAMPLES. *Environ. Sci. Technol., 9(13):1172-1174, Dec. 1975. 10 refs.*

Data were compared from the analysis of manually impinged 24-hour ambient air samples for sulfur dioxide by two commonly used automated methods and the Environmental Protection Agency reference method. The results from the Automated II system are on the average 0.012 micrograms SO2/ml (2 micrograms/cu m) higher than the reference method results. The Automated I system results are on the average 0.006 micrograms SO2/ml (1 microgram/cu m) higher than the Automated II system results or 0.018 micrograms SO2/ml (3 micrograms/cu m) higher than the reference method. These biases are not significant when considering the variations in duplicate analysis by each method. The automated methods are both adaptations of the West-Gaeke pararosaniline method to the Technicon Auto Analyzer System.

59928 **APTIC NO. 79245**

Loo, Billy W., Joseph M. Jaklevic, and Fred S. Goulding

DICHOTOMOUS VIRTUAL IMPACTORS FOR LARGE SCALE MONITORING OF AIRBORNE PARTICULATE MATTER. *California Univ., Berkeley, Lawrence Berkeley Lab., Energy Research and Development Administration Contract W-7405-ENG-48, Rept. LBL-3854, 40p., May 1975. 9 refs. (Presented at the Symposium on Fine Particles, Minneapolis, Minn., May 28-30, 1975.)*

A dichotomous virtual impactor for the monitoring of airborne particulate matter is described. Size segregation is effected by inertial impaction across a virtual surface into a volume of relatively stagnant air. Following a two-stage separation, the particle size fractions are deposited on membrane filters. About 95% of uncontaminated fine particles are collected by one filter, while all of the coarse particles along with the 5% of the fine fraction are collected by a second filter. The design parameters of the virtual impactor are optimized for minimum loss and sharp cut characteristics. A servo flow controller is used to maintain a constant sampling rate of 50 l/min with a particle size cut at 2.4 micron (Stokes diameter). Fully automated units are available for a computer controlled monitoring network. The sampling scheme is tailored to match the requirements of elemental analysis by X-ray fluorescence and total mass measurements by beta gauging. The impactor is especially useful for urban particulate sampling where bimodal particle size distributions suggest the use of a dichotomous sampling method with a cut point near 2 micron. (Author abstract modified)

59929 **APTIC NO. 83573**

Lord, Harry C., III

KEEP AN EYE ON YOUR EMISSIONS. *Instr. Control Systems, vol. 47:21-23, 1975.*

The use of absorption spectrometry in the analysis of stack gas emissions is discussed. The direct view optical instrument gives a representative analytical reading of the content of the moving gas molecules in the light path across the stack or duct, at any one instant in time. It can be physically mounted in the stack or the gas duct. Flue gas is not removed from its normal flow pattern, which eliminates those difficulties typically encountered with sampling systems and greatly increases the accuracy of the analysis. One optical absorption spectrometer can measure up to four constituents, including carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxides, hydrocarbons, or opacity.

59930 **APTIC NO. 79850**

Lukacs, Joseph

CONTINUOUS SOURCE MASS EMISSIONS MONITORING - AN OPERATIONS GUIDE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 6p., 1975. (Presented at the Air Pollution Control Association, St. Louis Section, Specialty Conference on Continuous Monitoring of Stationary Air Pollution Sources, St. Louis, Mo., March 20-21, 1975.)*

Continuous stack emissions monitoring is discussed in terms of controlling air pollution and optimizing process conditions. Material balance techniques are usable only where the feed into the process remains substantially constant in composition or where the composition is continuously monitored. Velocity measurement techniques are most appropriate where stack geometry allows linear correlation between true flow rate and measured velocities over the range of flow rates encountered. The costs of mass emission monitoring systems based on the velocity and material balance concepts are about the same, and both are about twice the cost of a system which measures only pollutant concentration.

59931 **APTIC NO. 82330**

Lyshkow, Norman A.

GAS DILUTION APPARATUS. *(Combustion Equipment Assoc. Inc., New York) U. S. Pat. 3,892,549. 6p., July 1, 1975. 3 refs. (Appl. June 13, 1974, 14 claims).*

A gas dilution apparatus for use in taking gas samples from gas streams containing pollutant gases is described. In the sampling of gas streams containing gases such as sulfur dioxide, sulfur trioxide, and nitrogen dioxide, it is necessary to dilute the gas stream to facilitate accurate measurements of the pollutant. In this apparatus the diluent gas is derived from a portion of the gas stream itself without the need to employ an exterior source of a diluent gas. This is an improvement over other devices which add an inert gas to the stream. In this apparatus a gas sample is drawn through the device for purification to form a diluent gas. A small quantity of the gas sample is diverted prior to purification, through a by-pass circuit for admixture with the diluent gas. The gas sample is diverted at low flow rates whereby the gas sample diverted does not have sufficient energy to entrain solid particulate matter and/or droplets of condensed liquids. Those components are separated from the sample as the small portion is diverted.

59932 APTIC NO. 82645

Macias, E. S. and R. B. Husar

ATMOSPHERIC PARTICULATE MASS MEASUREMENT WITH THE TWOMASS BETA ATTENUATION MASS MONITOR. *Preprint, Washington Univ., St. Louis, Mo., Dept. of Chemistry and Air Pollution Research Lab., 19p., 1975. 34 refs.*

A two-stage, on-line mass monitor with an aerosol size separator is described for the high resolution monitoring of atmospheric aerosols via the beta attenuation principle. The instrument independently analyzes the mass concentration of two particle size fractions. Coarse particles are inertially separated by impaction on filter paper, and the fine particle fraction is collected on a high-efficiency glass fiber filter. Carbon-14 is used as the source of beta particles which are detected by a solid-state silicon surface barrier detector coupled to fast low-noise nuclear electronics. A programmable calculator controls the monitor, calculates the mass concentration of each size fraction, and plots, prints, and stores the data on tape. The instrument is gravimetrically calibrated using laboratory and atmospheric aerosols. The instrument s precision is 4 micrograms/cu m for 10-minute sampling intervals, and the accuracy is 11%. Field tests of the monitor indicate that it is capable of ambient air monitoring with a time response of about 10 min. (Author abstract modified)

59933 APTIC NO. 82701

Macias, E. S, R. B. Husar, and J. D. Husar

MONITORING OF ATMOSPHERIC AEROSOL MASS AND SULFUR CONCENTRATION. *Preprint, Washington Univ., St. Louis, Mo., Dept. of Chemistry and Dept. of Mechanical Engineering, 5p., 1975. 11 refs. (Presented at Environmental Sensing and Assessment, Las Vegas, Nev., Sept. 14-19, 1975.)*

A technique for the simultaneous measurement of atmospheric aerosol mass concentration in two size ranges and sulfur content is described. The mass measurement is performed with a two-stage, on-line mass monitor and aerosol size separator employing the beta attenuation technique. This instrument independently analyzes the mass concentration of two particle size fractions. Coarse particles are inertially separated by impaction, and fine particle fraction is collected on a high-efficiency glass fiber filter. The mass concentration monitor is gravimetrically calibrated with several laboratory aerosols as well as with ambient aerosol from the St. Louis area. Filter samples collected by the aerosol monitor in the fine particulate mode (less than 3 micron in diameter) are analyzed for total sulfur content by flash vaporization flame photometry. This method is calibrated with five water-soluble sulfur compounds. The mass measurements are taken with a time resolution of 10 min and with a sensitivity of 5 micrograms/cu m. The sulfur samples are integrated over 2-hour intervals with a sensitivity of 0.6 micrograms/cu m of sulfur. (Author summary modified)

59934 APTIC NO. 80007

Madden, J. J. and B. N. Hoschke

A CHLORINE GAS CONCENTRATION MONITOR. *Am. Ind. Hyg. Assoc. J., 36(11):847-849, Nov. 1975. 6 refs.*

An alarm system to warn of unsafe chlorine levels is described. The instrument consists of a gas scrubber and a conductivity cell. An alternating current resistance measuring circuit is employed to prevent the instability due to electrode polarization that occurs if direct current is used. When the resistance of the solution between the electrodes drops to a selected value, the circuit oscillates and drives a loudspeaker. Calibration with an equivalent hydrochloric acid solution is described. This monitor was designed for use in areas where chlorine is the only water soluble gas expected to be present in appreciable amounts. However, other gases such as carbon dioxide, sulfur dioxide, and nitrogen dioxide can also be detected by this system, and it could equally well be calibrated for these. Calibration would be impossible in situations where several such gases are present, but the scrubber could be used to collect samples for analysis by other means.

59935 APTIC NO. 80492

Maeda, Kogoro and Shigeru Nakatani

STUDIES OF PHYSICAL MEASUREMENTS OF AIR POLLUTION. *(Taiki biryo yugai seibun no butsuri keisokuho ni kansuru kenkyu). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 10(6):31-48, Nov. 1975. 14 refs.*

The use of electromagnetic techniques for the anaylysis of sulfide air pollutants and the physical analysis of particulate pollutants are described. Good responses were obtained between the peak heights and the concentrations for ranges of 0.3-30 ppm carbon disulfide, 20-5 ppm methyl mercaptan (CH_3SH), and 30-3 ppm hydrogen sulfide. Deviations from the linear response were found in the range below 2-3 ppm CH_3SH and H_2S. The maximum number concentration of airborne particulates was located in the size range from 0.01 to 0.1 micron in radius. There was a strong inverse correlation between the conductivity and the lifetime of small ions. The diurnal variation of the particle sizes measured in the ambient air was opposite to that of the number concentration of particles.

59936 APTIC NO. 76391

Maguire, Brian A., Er[illegible] Saunders, and Geoffrey W. Harriss

RESPIRABLE DUST SAMPLING IN BRITISH QUARRIES. *Staub, Reinhaltung Luft, 35(11):397-403, 1975. 3 refs.*

The concentrations of respirable airborne dust were measured in British quarries, and the health hazard assessed using the Threshold Limit Values proposed by ACGIH. As a result of these surveys, deficiencies found in the existing dust sampling instruments resulted in the development of a new personal gravimetric dust sampling treatment, SIMQUADS. The new instrument will be commercially available in the near future. (Author abstract modified)

59937 APTIC NO. 82512

Manita, M. D., A. A. Galich and T. A. Vil ner

PHOTOMETRIC DETERMINATION OF SULFUR DIOXIDE IN THE AIR. *(O fotometricheskom metode opredeleniya sernistogo gaza v atmosfernom vozdukhe). Text in Russian. Gigiena i Sanit., no. 3:81-82, 1975.*

A new method is proposed for the preparation of the absorbent solution (sodium tetrachloromercurate) for the photometric determination of sulfur dioxide in the air. Sodium tetrachloromercurate is prepared from mercurous oxide instead of from mercuric chloride which is not readily available. The air to be analyzed is bubbled through 0.04 M sodium tetrachloromercurate solution at a rate of 0.05 liter/min. Comparative photometric measurements with absorbent solutions prepared from mercuric chloride and mercurous oxide revealed no noteworthy difference in sensitivity, selectivity, and reproducibility.

59938 APTIC NO. 83572

Manka, D. P.

COKE OVEN GAS ANALYSIS...MONITORING SULFUR AND CYANIDE. *Instrum. Technol., vol. 1975:45-49, Feb. 1975.*

A method of coke oven gas analysis for the monitoring of sulfur and cyanide is discussed. The gas produced by the carbonization process is treated to remove tar, ammonia, naphthalene, and aromatics before it is used as a fuel for many furnaces in the steel producing mills. A dual purpose automatic gas chromatograph with two detectors monitors gas composition. The high concentrations of cyanic acid and hydrogen sulfide are analyzed by thermal conductivity, and the low concentrations of the other sulfur compounds are determined by flame photometry. The S compounds are separated into CO carbonyl sulfide, H_2S, carbon disulfide, and sulfur dioxide. When the H_2S reaches the selector valve, the valve is switched to vent the H_2S into the atmosphere. There is sufficient time between the peaks of COS, H_2S, and CS_2 to permit complete venting of the H_2S so that it does not enter the flame photometric detector. Only COS, CS_2, and SO_2 are analyzed in the chromatograph.

59939 **APTIC NO. 83402**

Mantion, J. B., G. Mauvilet, and D. Perino

REMOTE DETECTION OF A GASEOUS POLLUTANT BY MEANS OF RAMAN LIDAR. *(Detection a distance d un polluant gazeux a l aide d un Lidar Raman). Text in French. Mes. Regulo, Automat. (Paris), no. 40:68-72, April 1975. 4 refs.*

A molecular spectroscopy method has been developed based on Raman retrodiffusion and utilizing Lidar. A telescope with optical filters is equipped with a photomultiplicator which converts the luminous impulses into electrical impulses. A 500 ppm concentration of sulfur dioxide has been detected at a 50 m distance during the night. An increase in the power of the laser should make it possible to measure a minimum sulfur dioxide concentration of 500 ppm at a distance of 700 m at night. Laboratory prototypes have already been constructed. In view of the low intensity nature of the Raman effect, it is unlikely that the method will be employed to analyze ambient air where pollutant concentrations are found in fractions of ppm. Other methods, such as differential absorption and resonance diffusion, are more adequate for the time being.

59940 **APTIC NO. 76326**

Marcus, Y.

ANALYTICAL CHEMISTRY IN ISRAEL. *Anal. Letters, 8(9):593-601, 1975.*

Analytical chemistry laboratories in Israel working on environmental problems are identified. The studies include: a broad program of routine monitoring, development of aerosol sampling equipment, methods of identification and measurements of air pollutants by neutron activation and by atomic absorption spectroscopy, and determination of traces of pesticide residues or of heavy metals, such as mercury in biological media.

59941 **APTIC NO. 83862**

Matano, Akinori, Yusaku Nogami, and Kineo Fujisawa

THE MEASUREMENT OF SUSPENDED PARTICULATES BY MIDDLE-VOLUME AIR SAMPLER. *(Midoru boryumu ea sanpura ni yoru fiirudo ni okeru hoshy kekka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):366, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 112.)*

Airborne particulates were measured by a newly developed middle-volume air sampler, and results were compared with measurements made by a digital dust counter and a low-volume air sampler. The middle-volume air sampler collects only the airborne particulates sized less than 10 micron. It is equipped with a glass fiber filter. Air sampling was conducted continuously for 24 hours using the middle-volume sampler, while the low-volume sampler collected continuously for 5 days (the total air volume sampled was the same in both cases). A comparison of the results using the three instruments was made on the basis of the 5-day average values. All three showed a similar trend for the measured airborne particulate concentration during the 2-month investigation period. The concentrations observed ranged from 95 to 25 microgram/cu m. The 24-hour average values for the middle-volume air sampler and digital dust counter were also compared and showed good similarity.

59942 **APTIC NO. 83950**

Matsuda, Yatsuka and Tetsuo Mamuro

SIMULTANEOUS ANALYSIS OF GASEOUS AND PARTICULATE SULFUR COMPOUNDS IN THE ATMOSPHERE BY X-RAY FLUORESCENCE SPECTROMETRY. *(Taikichu kitaijo oyobi ryushijo iou no keiko X-sen bunsekiho ni yoru doji bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4): 80, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 127.)*

The simultaneous analysis of gaseous and particulate sulfur compounds was studied. Sample collection was by a filter holder equipped with two different filters in series. The first filter was a membrane filter which collected particulate sulfur compounds and the second filter was a Whatman filter with an alkaline solution which collected gaseous sulfur compounds. The collected sulfur on the filters was analyzed by the X-ray fluorescence method. Sampling was at a rate of 18 l air/min. Atmospheric sulfur measurements made in Osaka by this method showed a maximum gaseous sulfur content of 36 microgram/cu m air and a maximum particulate sulfur content of 4.8 microgram/cu m air. The detection limit by the X-ray fluorescence method was 2 microgram S/sq cm filter paper, which was equivalent to 0.007 ppm sulfur dioxide if the sampling was made for 60 min at a rate of 18 1/min. No hydrogen sulfide gas was collected on the alkaline filter.

59943 **APTIC NO. 83160**

Melia, J., F. Senent, A. Travesi, and A. Yeves

NEUTRON ACTIVATION ANALYSIS OF ATMOSPHERIC DUST SAMPLES FROM URBAN AND RURAL REGIONS OF VALENCIA. PART I. *(Estudio por activacion neutronica de muestras de polvo atmosferico procedentes de medios urbanos y rurales de Valencia. I). Text in Spanish. An. Fis., 71(2):139-142, April-June 1975. 10 refs.*

Because of its sensitivity and accuracy, neutron activation analysis has been applied to samples of atmospheric dust. Data on winter anticyclones of 1973 are compared with data on those of 1941-1960 for the month of December and the winter season itself. For contaminant identification two different irradiation techniques were used following sampling for simple determinations and radionuclide studies with subsequent analyses by detectors (Nuclear Enterprise 767, ORTEC 8013-25400). Preparation and treatment of spectra are discussed with respect to statistical significance of photopeaks attained. Elements were classified into three categories (chlorine, vanadium and mercury; other metals; and bromine and arsenic) regarding urban and rural climatology.

59944 **APTIC NO. 82296**

Menzies, Robert T. and James C. Fletcher

FLUORESCENCE DETECTOR FOR MONITORING ATMOSPHERIC POLLUTANTS. *(National Aeronautics and Space Administration, Washington, D. C.) U. S. Pat. 3,891,848. 6p., June 24, 1975. 9 refs. (Appl. Dec. 27, 1973, 12 claims).*

A remote monitoring technique for measuring gas molecules in the atmosphere and in exhaust streams is described. A laser source is used to excite the atmospheric area which contains the pollutants to be analyzed, and the laser s beam causes the pollutants to fluoresce and emit a return signal to a detector. The detector includes a gas cell that contains a compartment filled with the pollutant to be studied. This compartment absorbs the fluorescence from the reflected pollutant signal received at the detector. Another compartment is provided in the gas cell, and the fluorescence of the reflected pollutant signal passes unimpeded through this second compartment. A difference measuring circuit detects the difference in output signals from the two compartments to obtain a signal indicative of the magnitude of the pollutant being analyzed. (Author abstract modified)

59945 APTIC NO. 73492

Meppelder, F. H.

METHODS FOR THE DETERMINATION OF NITROGEN OXIDES IN THE ATMOSPHERE. *Stichting Concawe, The Hague (Netherlands), Special Task Force on the Study of Air Pollution Sampling and Survey Techniques, Rept. 5/75, 94p., March 1975. 132 refs.*

Manual and automatic methods for the determination of atmospheric nitric oxide and nitrogen dioxide are reviewed. Analytical techniques covered include: various colorimetric methods, gas chromatography, electrochemical procedures, chemiluminescence, various spectrophotometric procedures, long-path visible photometry, and laser techniques. Calibration procedures and the preparation of reference samples for standardizing measuring equipment are also presented. The oxidation of NO to NO2 is reviewed in relation to NO determinations.

59946 APTIC NO. 76017

Miller, C. R. and C. M. Sonnenschein

REMOTE MEASUREMENT OF POWER PLANT SMOKE STACK EFFLUENT VELOCITY (FINAL REPORT). *Raytheon Co., Sudbury, Mass., Electro-optics Dept., Environmental Protection Agency Contract 68-02-1752, Program Element 1AA010, ROAP 26AAP-85, Rept. EPA-650/2-75-062, 123p., Aug. 1975. 7 refs.*

NTIS: PB 245792/AS

A carbon dioxide laser Doppler velocimeter designed to measure remotely the velocity of stack effluents from power plants is described. Laser radiation backscattered from particulates in the effluent is Doppler shifted in frequency in proportion to the velocity of the effluent. The method appears to be useful for the monitoring of particulate flow rates and the determination of particulate concentrations in stack effluents from stationary sources. Measurements made against a coal-burning power plant plume are described. (Author summary modified)

59947 APTIC NO. 83441

Miller, Christopher R., Charles M. Sonnenschein, William F. Herget, and R. Milton Huffaker

LASER DOPPLER SYSTEMS IN POLLUTION MONITORING. *Preprint, Raytheon Co., Sudbury, Mass., Environmental Protection Agency, Research Triangle Park, N. C., and National Aeronautics and Space Administration, Huntsville, Ala., 5p., 1975. 7 refs.*

The feasibility of using a laser Doppler velocimeter for the remote measurement of both smoke stack velocity and particulate concentration was investigated. The basis of the technique is that laser radiation scattered from particulates in the air is Doppler shifted in frequency, and measurement of this Doppler frequency shift yields the velocity of the particulates. Velocity data are both self consistent and in good agreement with pitot tube data. Deviations between the velocimeter and the pitot tube are systematic and probably associated with a relative miscalibration between the two instruments. A least square fit analysis of the velocity data indicates an accuracy of about 1 m/sec. Correlations between the velocimeter signal strength and plume opacity and between plume opacity and mass concentration indicate that the velocimeter is capable of measuring mass concentration from a smoke stack which when combined with velocity data yields a mass flow rate measurement. Thus a single velocimeter appears capable of remotely measuring the mass flow from smoke stacks. (Author conclusions modified)

59948 APTIC NO. 80091

Miller, J. A. and F. X. Mueller

EVALUATION OF A CONTINUOUS INSTRUMENTAL METHOD FOR DETERMINATION OF ISOCYANATES. *Am. Ind. Hyg. Assoc. J., 36(6):477-483, June 1975. 14 refs.*

The response of a continuous toluene diisocyanate monitor was evaluated using the National Institute of Occupational Safety and Health (NIOSH) modified Macali spectrophotometric method as the reference analytical procedure. Test atmospheres containing low concentrations of toluene diisocyanate were generated and analyzed in both a dynamic diffusion system and a closed test facility; factory analyses were also made. Agreement of simultaneous measurements in the laboratory and in the field verify that the instrument is a valid alternative to the Marcali method. Results obtained following the NIOSH recommended air sampling procedure indicate that, when Marcali analysis is necessary, two impingers should be employed in series to insure total collection of isocyanates. (Author abstract modified)

59949 APTIC NO. 82799

Minagawa, Okie, Yukio Takizawa, and Ikuhide Kifune

MEASUREMENT OF METHYLMERCURY IN AMBIENT AIR. *(Taikichu no mechiru suigin no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):4, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 65.)*

A measurement method for micro-amounts of atmospheric methyl mercury by solid phase absorption was established. As a sampling device, a glass absorption tube 9 mm in diameter packed with Chromosorb W coated with sodium hydroxide (Chromosorb layer 60 mm) and connected to a small suction pump is used. After sampling, the Chromosorb W is extracted with 3 N hydrochloric acid and benzene. The C6H6 extract is neutralized with NaOH solution and then extracted with 1% aqueous cystine solution. To the cystine extract obtained, 6 N HCl and C6H6 are added, and the mixture is analyzed by ECGC. The stability of methyl mercury in the absorption tube was sufficient, and no decomposition was observed up to 20 days. The optimum mesh size in terms of collecting efficiency was 100-120 mesh. The desorption of methyl mercury was about 100% (110-90%). The detectable concentration limit was 0.04 microgram/cu m.

59950 APTIC NO. 83869

Minato, Takashi, Yukio Kojima, and Katsutoshi Kanezuki

ATMOSPHERIC CYANIDE GAS MEASURING METHOD. *(Kichu no seisan gasu nodo sokutei hoho). Text in Japanese. (Japan Exlan Co., Ltd. (Japan)) Japan. Pat. Sho 50-38356. 6p., Dec. 9, 1975. 6 refs. (Appl. June 8, 1971, 1 claim).*

A process for an improved industrial method for measuring atmospheric cyanide which coexists with reducible gases such as hydrogen sulfide and sulfur dioxide is presented. The conventional method for measuring cyanide uses a gas detection tube which is extensively utilized because of its operational simplicity; however, it is almost impossible to detect atmospheric cyanide which coexists with hydrogen sulfide and sulfur dioxide because the detecting agent changes its color due to the coexisting reducible gas. The distinctive characteristic of the improved gas detection tube method is layers of fillers into which the sampled gas is introduced. The layers are filled with an absorbent which will oxidize and absorb only reducible gas. After passing the layers of fillers, the test sample gas is directed to the gas detection tube where cyanide can be measured very accurately. Dichromate is used as the absorbent for hydrogen sulfide and sulfur dioxide, and diatomaceous earth is used as the carrier for the dichromate. This method completely removes the reducible gas in the gas sample and achieves an accurate measurement of atmospheric cyanide without any influence of the reducible gas.

59951 **APTIC NO. 76006**

Mitchell, William J. and M. Rodney Midgett

METHOD FOR OBTAINING REPLICATE PARTICULATE SAMPLES FROM STATIONARY SOURCES (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab., Program Element 1HA327, ROAP 26AAG, Rept. EPA-650/4-75-025, 32p., June 1975. 7 refs.*

NTIS: PB 245045/AS

Dual sampling arrangements that allowed four independent trains to sample simultaneously at the same point in a stack were used to obtain replicate particulate samples from stationary sources. A total of 16 particulate sampling runs with four identical Environmental protection Agency Method 5 particulate trains revealed that the magnitude of the within-run standard deviation was linearly related to the magnitude of the mean particulate concentration measured for that run. However, no such relationship was found between the within-run standard deviation and either the run sampling time or the total volume of gas sampled. A statistical analysis of the percent moisture in the stack determination was used to estimate the precision of the condensation technique used in the Method 5 train. (Author abstract modified)

59952 **APTIC NO. 80805**

Miyamoto, Isao, Gunji Kawasaki, Masao Yamazaki, Osamu Ideguchi, and Kiyoto Kawasaki

ON ANALYSIS OF COBALT IN AIRBORNE PARTICULATE BY CARBON ROD ATOMIZER. *(Kabon roddo atomaiza ni yoru fuyu funjinchu no kobaruto no bunseki ni tsuite). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 189, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper ID08.)*

The analysis of colbalt in airborne particulates by carbon rod atomizer atomic absorption spectrometry is reported. A 5 microliter sample was used. It was dried for 25 sec at 0.7 V and ashed for 35 sec at 0.7 V before the atomization step. The optimum voltage for the atomization was 5 V, based on the absorption peak height measured at 240.7 nm with the nitrogen flow rate at 7.5 l/min. The effect of the presence of acids in the sample solution on the cobalt absorption was examined. Neither hydrochloric acid nor phosphoric acid up to 1.0 N interfered with cobalt absorption; however, both nitric acid and sulfuric acid gave lower absorption peaks of cobalt, and the effect of the latter was greater than that of the former. No effect on cobalt absorption was observed for magnesium, sodium, potassium, zinc, or nickel concentrations of 500 times that of cobalt; however, calcium, aluminum, iron, and manganese gave lower colbalt absorption figures. Of these metals, the calcium inteference was largest. The cobalt absorption peak height decreased by 30% with a calcium concentration of 500 times that of cobalt. Thus, airborne particulate samples had to be dissolved into HCl or aqua regia, and a solvent extraction technique had to be used, when the interfering elements in the airborne particulates were present in high levels.

59953 **APTIC NO. 76586**

Miyazaki, Motoichi, Hiroyuki Nakazawa, and Yasuhiro Yamane

GAS CHROMATOGRAPHIC ESTIMATION OF IRON IN AIR-BORNE PARTICULATES. *Chem. Pharm. Bull., 23(10):2436-2438, Oct. 1975. 8 refs.*

A method for the gas chromatographic estimation of iron in airborne particulates is described. The particulate is ashed in an electric furnace and digested with nitric acid. The acidic digest is neutralized with sodium hydroxide and buffered with acetate buffer at pH 4.5, and treated with 0.5% trifluoroacetylacetone (TFA)-benzene solution to extract Fe as Fe TFA chelate. The extracted chelate is submitted to gas chromatography. The method is comparable to spectrophotometry for analysis of Fe in the airborne particulates. (Author abstract modified)

59954 **APTIC NO. 80089**

Moore, David E. and Thomas J. Smith

RESPIRATOR COMPENSATION OF A PORTABLE AIR MONITOR. *Am. Ind. Hyg. Assoc. J., 36(6):430-432, June 1975. 1 ref.*

Discretionary use of a respirator can destroy the validity of personal monitor samples by consistently reducing a worker s real exposure level below that measured by a continuous sampling device. A portable personal air monitor was adapted to compensate for respirator use. A switching circuit box, integrated into the sampling pump electrical system and activated by a micro switch mounted within the respirator mask, turns the pump off and a timer on whenever the respirator is worn. Thus, valid measurements of an individual worker s environmental exposures can be made even though that worker uses a respirator at his own discretion. (Author abstract modified)

59955 **APTIC NO. 82700**

Morgan, James J.

SAMPLING AND ANALYSIS OF METALS IN AIR, WATER AND WASTE PRODUCTS. *Preprint, California Inst. of Tech., Pasadena, W. M. Keck Labs. of Environmental Engineering Science, 9p., 1975. 83 refs. (Presented at the Environmental Sensing and Assessment Conference, Sept. 14-19, 1975.)*

Methods for the sampling and analysis of metals in air, water, and waste products are reviewed. Analytical methods discussed include: atomic absorption spectrometry, non-flame atomic absorption spectrometry, instrumental neutral activation analysis, X-ray fluorescence analysis, emission spectrometry, anodic stripping voltammetry, spectrophotometric methods, colorimetry, multi-element atomic fluorescence, and spark source mass spectrometry. Related topics discussed include: sampling and storage procedures, concentration procedures, and losses and contamination in processing. The comparative detection limits of atomic absorption spectrometry, non-flame atomic absorption spectrometry, X-ray fluorescence analysis, and instrumental neutron activation analysis are presented for the analysis of beryllium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, arsenic, selenium, molybdenum, cadmium, tin, antimony, barium, lead, bismuth, palladium, and mercury contained in aerosols.

59956 **APTIC NO. 80028**

Morita, M., S. Mimura, and G. Oi

AIR POLLUTION MONITORING BY PIGEON IN THE CASE OF PARA- DICHLOROBENZENE. *(Hato o senser to suru osen-monitor - parachlorobenzene no kankyo osen). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 22(10):389, Oct. 1975. (Presented at the Japanese Society of Public Health Annual Meeting, 34th, Yokohama, Oct. 29-31, 1975.)*

Adipose tissues of pigeons caught in the city center and the suburbs of Tokyo were analyzed with steam distillation, using sulfuric acid and gas chromatography with ECD. In the gas chromatograms of pigeon fat, human fat, and air, a peak was found and identified as para-dichlorobenzene. Its content in pigeon fat averaged 1.85 + or - 0.75 ppm. Paradichlorobenzene has hitherto not been detected in milk and cereals, but in environmental air. The content of paradichlorobenzene in human fat, detected by the same method, was 1.88 + or - 2.13 ppm. The para-dichlorobenzene content of pigeon fat showed no local differences.

59957 **APTIC NO. 76542**

Moyer, William W. and Fred P. Osman

A MICROPROCESSOR-BASED AIR QUALITY MONITORING SYSTEM. *J. Air Pollution Control Assoc., 25(11):1155-1157, Nov. 1975. 2 refs.*

A microprocessor-based air quality monitoring unit was developed for use with existing sensors. The unit is portable and its operational sequence can be programmed to adapt it to any unique requirements existing at the deployment site. Selectable on site calculations are performed on raw data, and a hard copy or tape record of results can be produced.

59958 **APTIC NO. 82782**

Mullins, Billy J., Jr. and Sam Humphries, Jr.

TECHNIQUE FOR INSURING THE VALIDITY OF SAMPLES FOR HIGH CONCENTRATIONS OF SULFUR DIOXIDE USING THE EPA METHOD 5 SAMPLING TRAIN. *Preprint, Ecology Audits, Inc., Dallas, Tex., 17p., 1975. 11 refs. (Presented at the Energy and the Environment National Conference, 3rd Oxford, Ohio, Sept. 29-Oct. 1, 1975.)*

The Environmental Protection Agency Method 5 sampling train was evaluated for use in sampling relatively high concentrations of sulfur dioxide. The collection efficiency of the Method 5 sampling train, although dependent on the sampling rate, was far more dependent on the sample volume; collection efficiency increased as smaller sample volumes were collected. The saturation point of the hydrogen peroxide absorber was approached when the collection efficiency decreased below approximately 60%. The saturation point also appeared to be dependent on sample volume, with the saturation point being reached at a sample volume between 20 and 40 standard cu ft. The EPA Method 5 sampling train proved to be a reliable procedure for measuring high concentrations of SO2 and also provided a procedure for measuring particulate and SO2 concentrations simultaneously at any sampling rate if the sample volume was not excessively large. (Author conclusions modified)

59959 **APTIC NO. 82904**

Munemori, Shin and Yasuaki Maeda

INTERFERENCES OF OZONE AND HYDROGEN PEROXIDE ON COLORIMETRY DETERMINATION OF FORMALDEHYDE. *(Horumu arudehido no hishoku teiryo ni okeru ozon oyobi kasanka suiso no kansho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):324, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 67.)*

The interference of ozone and hydrogen peroxide with formaldehyde determination by the 3-methyl-2-benzothiazolone hydrazine (MBTH) method, the chromotropic acid method, the pararosaniline method, and the acetylacetone method was studied. For formaldehyde levels around 0.2 ppm, ozone interference was considered up to 10 microgram ozone/ml; H2O2 interference was considered up to 4 microgram H2O2/ml. No ozone interference was observed with the acetylacetone method, parasoniline method, or chromotropic acid method, and the former two methods did not suffer from the H2O2 interference either. The MBTH method was affected by both ozone and H2O2, and the absorbance of formaldehyde linearly increased with the presence of increased amounts of ozone or H2O2. The absorbance of 0.17 ppm HCHO nearly doubled with the presence of 8 microgram O3/ml. The presence of H2O2 decreased the absorbance of HCHO in the chromotropic acid method. The pararosaniline method was the best method for HCHO determination with respect to both detection sensitivity and interference.

59960 **APTIC NO. 82752**

Myers, R. Lee and James A. Reagan

THE REGIONAL AIR MONITORING SYSTEM. ST. LOUIS, MISSOURI U.S.A.. Preprint, Rockwell Air Monitoring Center, St. Louis, Mo. and Environmental Protection Agency, St. Louis, Mo., 9p., 1975. 2 refs. (Presented at the International Conference on Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)

The Regional Air Monitoring System which is the ground-based air quality measurement network of the Regional Air Pollution Study in the St. Louis, Missouri area is described. This 25 station network is the most sophisticated air monitoring system currently operational. The central purpose of the RAPS is to produce for a single urban area enough information on all processes that determine the concentrations of air pollutants so that they can be described in a system of mathematical models. Air pollutants monitored by the network include: ozone, nitrogen oxides, hydrocarbons, carbon monoxide, total sulfur, sulfur dioxide, and total suspended particulates. Atmospheric parameters which include solar radiation, barometric pressure, dew point, atmospheric temperature, wind direction and speed, and turbulence are also monitored. Data are received from each station at 1-minute intervals and are processed at a central computer facility. Software for the network is divided into two logical parts: real time software and background data processing.

59961 **APTIC NO. 80698**

Nadkarni, R. A.

MULTIELEMENT ANALYSIS OF COAL AND COAL FLY ASH STANDARDS BY INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS. *Radiochem. Radioanal. Lett., 21(3-4):161-176, May 10, 1975. 32 refs.*

A mutltielement analysis of coal and coal fly ash standards was made by instrumental neutron activation analysis. A total of 39 major, minor, and trace elements in the National Bureau of Standards standard reference materials coal: SRM-1632 and coal fly ash: SRM-1633 is reported. Out of the 39 elements determined in coal and fly ash standards, potassium rubidium, nine rare earths, hafnium, tantalum, aluminum, bromine, and iodine in coal, and nine rare earths, Hf, Ta, Al, and Br in fly ash are reported for the first time. The relative standard deviations vary from less than 2% for lanthanum, Hf, scandium, lutetium, chromium, europium, Ta, and arsensic, to over 25% for antimony and cesium. The overall precision is 5-10% for most of the elements.

59962 **APTIC NO. 82197**

Nakadoi, Takashi, Hidetoshi Fujimori, and Yoshiki Yagi

COMPARISON OF TWO METHODS USING NON-METHANE HYDROCARBON ANALYZER. *(Himetan tankasuisokei ni okeru 2 hoshiki no hikaku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):312, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 54.)*

A comparison of non-methane hydrocarbon measurement by direct and indirect methods was made using a hydrocarbon analyzer which gave non-methane hydrocarbons measurement both directly and indirectly. The direct determination method was done by separating non- methane hydrocarbons in the sample gas from methane by a column which was then back-flushed to detect all non-methane hydrocarbons as a single peak by flame ionization detector. The atmospheric non-methane hydrocarbons level was measured by the analyzer giving both direct and indirect measurements. The non-methane hydrocarbon level was higher by the direct method than the indirect method. The average of 1 hr average level of non-methane hydrocarbons was 1.011 ppmc by the direct method, while it was 0.574 ppmc by the indirect method.

59963 **APTIC NO. 84209**

Nakao, Shozo and Ikuo Hirose

ANALYTICAL METHODS FOR SEPARATION OF FLUORIDE FROM FLUORIDE COMPLEX IN ATMOSPHERIC SAMPLES USING GEL-CHROMATOGRAPHY. *(Taiki chu no fukkabutsu oyobi fusso-saku kagobutsu no gerukuromatogurapfi ni yoru bunri bunsekiho to sono oyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):306, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 48.)*

A separation method for fluoride ion compounds and hexafluorosilicate (IV) complex compounds by gel-chromatography was studied. The column materials examined were Sephadex-G10, ECTEOLA, alumina, and an ion exchange resin. No separation could be obtained by the latter two column materials, but separation could be achieved by the former two. The fluoride ion compound in 0.05 N sodium chloride solution was not absorbed with Sephadex-G10 but the hexafluorosilicate complex compound in the same solution was absorbed with this column material and could be eluted with 0.5 N sodium chloride solution. The fluoride ion compound in water was not absorbed with ECTEOLA but the hexafluorosilicate complex in the same solution was adsorbed with this column material and could be eluted with 0.05 N sodium chloride solution. The method was applied to analyze atmospheric fluoride compounds. Of the fluoride compounds, 1290 were fluoride ion and the remaining 88% were fluoride complex.

59964 **APTIC NO. 83848**

Nakatani, Shigeru and Tomoyoshi Tsunoda

DETERMINATION OF THE PARTICLE SIZE DISTRIBUTION OF SUB-MICRON AEROSOLS. *(Sabumikuron ryushi no ryukei bunpu no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):364, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 110.)*

A newly manufactured apparatus for determining the particle size distribution for sub-micron particles is described. The apparatus is based on the difference in the mobility of charged particles. It has a parallel electric field through which the aerosol passes. The mobility of differently charged particles is measured from the electric current on an electrode by varing the voltage. The apparatus was used to measure an atmospheric aerosol size distribution. Although observation of several peaks for the aerosol size distribution curve was anticipated, there was only one peak observed, at around 0.05 micron. It required 20 min for one scan to complete the size distribution curve from 0.1 to 0.01 micron.

59965 **APTIC NO. 84206**

Narita, Kiichi, Hiroshi Hara, Fukuo Sagawa, and Takumi Nakagi

COMPARISON STUDY OF AUTO-ANALYZERS FOR ATMOSPHERIC NOX MEASUREMENT. *(Kankyochu NOx jido bunsekikei no hikaku kento ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):285, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 22.)*

Two auto-analyzers of the same type for nitrogen oxides using the Saltzman method (NOx meters A and B) were compared and evaluated. The NOx meter A indicated about 23% higher nitric oxide and nitrogen dioxide values than NOx meter B. The deviation of the sample gas flow rate was found to be + 26 ml/min and - 27 ml/min for meters A and B, respectively, and the difference was 53 ml/min. Both meters indicated the same NOx measurement for the same sample gas after the flow rate of two meters was adjusted to be the same; however, meter B showed a 1.4 times higher NO value than the other meter, and meter A showed a 1.3 times higher NO2 value than the other. The absorption efficiency of four impingers used in the meters was determined. For NOx gas concentrations up to 2.20 ppm, the average absorption efficiency of two impingers was more than 95%, while that of other two was 93% and 89%, which indicated that the difference in the absorption efficiency of impingers greatly affected the NO and NO2 determinations.

59966 **APTIC NO. 82364**

Naumann, Robert J.

CARBON MONOXIDE MONITOR. *(National Aeronautics and Space Administration, Washington, D. C.) U. S. Pat. 3,895,912. 5p., July 22, 1975. 5 refs. (Appl. Nov. 6, 1975, 3 claims).*

A device for the automatic, real-time, continuous monitoring of carbon monoxide is described. The monitor includes two Y-cut, temperature sensitive quartz crystals which are encapsulated in a helium filled can. A wire mesh which carries a thin layer of hopcalite coating surrounds one of the cans containing the quartz crystal. The hopcalite is used for oxidizing the carbon monoxide, and the resulting heat of the reaction is detected by the temperature sensitive crystal. Each crystal is driven by a conventional crystal controlled oscillator circuit with a constant frequency bias of a few hundred Hertz. The frequencies of the two oscillator circuits are fed into a conventional mixer circuit which beats the frequencies against each other to produce a single net frequency which is the difference between the two frequencies. The net frequency signal is converted to a direct current analog voltage signal which is then fed into a suitable display device for providing a continuous readout of the carbon monoxide concentration. Unlike prior art designs, the present invention eliminates crystal contamination by deposits and allows for the easy removal of the catalytic coating from the crystal. (Author abstract modified)

59967 **APTIC NO. 83173**

Neti, Radhakrishna M.

NITROGEN DIOXIDE ANALYSIS. *(Beckman Instruments, Inc., Fullerton, Calif.) U. S. Pat. 3,870,468. 5p., March 11, 1975. 7 refs. (Appl. June 16, 1972, 10 claims).*

A method and apparatus for converting nitrogen dioxide to nitric oxide for the ultimate reaction with ozone to cause a chemiluminescent reaction are described. The intensity of the reaction is a function of the NO concentration. The method consists of passing the NO2 through a small, confined volume and applying concentrated heat to the volume in the presence of suitable amounts of vitreous carbon. Nitrogen dioxide is converted to NO at conversion temperatures lower than those utilized in the prior art. Inteference from ammonia and other sample gas components are minimized. (Author abstract modified)

59968 **APTIC NO. 82623**

Newill, Vaun A.

FUTURE ENVIRONMENTAL QUALITY MONITORING AS RELATED TO HUMAN HEALTH. *Preprint, Exxon Corp., Linden, N. J., Research and Environmental Health Div., 3p., 1975. 3 refs. (Presented at the International Conference on Environmental Sensing and Assessment, Las Vegas, Nev., Sept. 19, 1975.)*

The weakest link in most health effects studies is the estimate of the pollutant exposure. The averaging time over which the pollutant level is measured should be related to the exposure time necessary to create or cause the effect in question. Transformations of pollutants must also be considered in the development of a monitoring program. Methods that give the integrated exposure dose for the individual must be developed. Such personal monitors have rarely been used among the general public. Plants can be low cost monitors and by a proper choice of plants a range of air pollutants can be identified as being present above certain critical concentrations. Other kinds of biological indicators include cell-free systems, cultured cells, tissues and organs, whole organisms, and communities of organisms. The problems involved in surveillance of industrial groups are discussed. Such a system has potential for detecting problems not anticipated by previous toxicity testing. Routine general population surveillance should also be carried out through detailed analysis of vital records and special population surveys. An index useful in indicating progress of component programs in achieving their desired goals is recommended. There should be only a few such indices and they should summarize the total environmental regulatory effort.

59969 APTIC NO. 81232

Nishino, Shozo

ON THE DETERMINATION OF MACHINE-CLEANING OIL MIST IN THE ATMOSPHERE. *(Taikichu no kikai senjoyu misuto no sokutei ni tsuite). Text in Japanese. Toyama Kenritsu Gijutus Tankidaigaku Kenkyu Hokoku (Bull. Res., Toyama Coll. Technol.), vol. 8:1-6, March 1975. 4 refs.*

Carbon tetrachloride was used to capture intermediate hydrocarbons in atmospheric mist from machine-cleaning oils. Two potash bulbs were used in series. The first was cooled in ice water; the second, in a freezing mixture (ice:salt (3:1); -18 C). Each bulb also was equipped with a water-cooled condenser. The flow rate of air ranged from 0.6-1.2 l/min. Gas chromatography was used for quantitative and qualitative analyses. In summer, 99.0% collection efficiency was exhibited under laboratory conditions. Under factory conditions, oil mist concentrations were about 100 mg/N Cu m. In the United States, the proposed permissible concentration of oil mist (without vapor) is 5 mg/N cu m.

59970 APTIC NO. 80348

Nishihita, Takao, Seigo Yamazoe, William R. Mallett, Masayuki Kashiki, and Shozo Oshima

DETERMINATION OF POSSIBLE OLEFIN INTERFERENCE IN THE ANALYSIS OF LEAD IN GASOLINE BY ATOMIC ABSORPTION SPECTROSCOPY. *Anal. Letters, 8(11):849-455, 1975. 9 refs.*

An experimental study was conducted to determine whether suspected interactions between olefins and the iodine used to level the variation in response between lead alkyl types invalidated the standard atomic absorption spectroscopy method for determining lead in gasoline. Gasolines with widely different olefin contents were analyzed using the standard method. Olefins did not interfere with the lead analysis even whth the concentration of olefins was 254 times that of iodine in the test gasoline.

59971 APTIC NO. 82883

Nishiyama, Kenichiro, Minoru Nishida, Akira Yamamoto, and Yashuhiro Hayashi

AIR POLLUTION CONTROL METHODS BY THE SOURCE MONITORING SYSTEM. *(Hasseigen kanshi sochi no riyo ni yoru taiki osen kisei kanri hoho no kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):422, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 294.)*

Air pollution control processes including time series analysis and forecasting simulation based on data obtained by source monitoring, which can be applied to K value control and total emission quantity control, are described with flow sheets of the control process. As an example, the desulfurization efficiency of an open hearth furnace was calculated using data obtained at a plant in Osaka during the period of Jan. 15-20, 1975. Descriptions of the calculation method for the hourly desulfurization rate based on sulfur dioxide and oxygen concentrations in the flue gas and the sulfur content of the fuel are given. The estimated population means were 54.1% (lower limit), 56.6% (mean) and 59.1% (upper limit) (significant at 1% level). The mean desulfurization rate at the plant was 54%; the K value and mean S content were calculated, and suitable administrative guidelines in compliance with emission standards are given. The hourly desulfurization rate fluctuated in the range of 30-71%.

59972 APTIC NO. 81531

Nomura, T. and K. Izutsu

ATMOSPHERIC POLLUTANT DETECTORS WHICH MAKE USE OF PIEZOELECTRIC QUARTZ CRYSTALS. *(Suisho atsuden kessho wo mochiiru daiki osen busshitsu kenshutsuki). Kagaku (Science), 30(2):156-158, 1975. 10 refs. Translated from Japanese, 8p.*

The application of piezoelectric quartz crystals to the detection and measurement of air pollutants is reviewed. Crystal methods are based on the fact that when foreign matter is present on the crystal surface of a quartz oscillator the frequency of vibration is sensitive to this and changes in accordance with the weight of the foreign material. Specific applications are cited in reference to the detection of organophosphorus compounds, sulfur dioxide, and hydrocarbons, water vapor, and hydrogen sulfide via gas chromatography.

59973 APTIC NO. 80000

Numano, Y.

GASTEC DETECTOR TUBE FOR LOW LEVEL VINYL CHLORIDE MONOMER. *(Gasutekku enbi monoma teinodoyo kenchikan ni tsuite). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 15(8):12, Aug. 1975.*

The GASTEC detector tube developed by the Kitazawa Industrial Co. for the detection of a low level vinyl chloride monomer is described. The tube consists of two parts; a reaction tube and a detection tube, which are connected by rubber tubing. The reaction tube contains a removal layer at the sample inlet side which removes gases such as chlorine and hydrogen chloride from the sample gas before it passes through the oxidation layer. The vinyl chloride monomer is oxidized and decomposed, producing hydrogen chloride gas at the oxidation layer, which contains a weak oxidizing agent. The HCl gas enters the detection tube, which contains benzeneazophenylamine adsorbed on silica powder. The silica powder changes its color to purplish red upon contact with HCl, and the wavelength of the color measures the vinyl chloride concentration of the sample. The calibrated graduation for 1 to 14 ppm is printed on the detection tube. The sample is sucked into the detector tube by a small pump (300 g) attached to the tube. The one stroke operation of the pump sucks 100 ml/ sample of air. The 1 to 14 ppm graduation on the detection tube represents the vinyl chloride concentration with four stroke operations. Therefore, by using a different number of strokes, various vinyl chloride concentrations can be determined by applying an appropriate coefficient to the graduation. The detection limits by the 8 stroke, 4 stroke, and 2 stroke operations were 0.1 ppm, 0.2 ppm, and 0.4 ppm respectively; 0.1 ppm to 28 ppm vinyl chloride could be determined using these stroke combinations. The presence of halogenated unsaturated hydrocarbons added positive error to the vinyl chloride determination of the detector tube.

59974 APTIC NO. 83443

O Keefe, Andrew E.

MONITORING PERSONAL EXPOSURE. PRESENT AND FUTURE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 2p., 1975 (?).*

Possible techniques for the measurement of personal pollutant exposure are discussed in connection with pollutant-health effect studies. Instruments utilizing gas-phase chemiluminescent reactions currently exist for the measurement of ozone, nitric oxide, and nitrogen dioxide. A chemiluminescent ozone monitor has been successfully adapted through miniaturization and simplification for personal dosimeter use. Tape sampler type instruments that constitute the reduction of classifcal wet colorimetric procedures for NO2 and sulfur dioxide appear worthy of further development for personal monitoring applications. Another option available for the development of personal pollutant dosimeters is the use of new sensing devices as a matrix of semiconductors selected to respond simultaneously to pollutants whose health effects are in question. A final option is the exploitation of classical laboratory measurement methods in miniaturized form, with the collection of pollutants being performed either on an appropriate quasispecific sorbent or as a metastable reaction product.

59975 **APTIC NO. 82506**

Ocepek, Drago and Emil Eberl

SOME PROBLEMS WITH THE DETERMINATION OF FINEST GRAINS. *(Einige Probleme der Feinstkornbestimmung). Text in German. Freiberger Forschungsh. A, vol. 531:19-31, 1975. 8 refs.*

The accuracy, reproducibility and comparability of the measurement of fine particulate matter by the Andreasen pipette method, Sartorius sedimentation scales, and by Coulter counter were studied. Quartz, caolin and corundum were used as test substances. All three methods were found to be highly accurate and reproducible, and the Coulter counter method was the most exact one. The three methods gave different particle size distributions for identical samples. It is possible to describe all distribution curves by a Pearson type differential equation.

59976 **APTIC NO. 82266**

Ogikubo, Takeo, Hidetomo Sasaki, and Katsunori Honma

CONTINUOUS MONITORING APPARATUS FOR AEROSOL, DIGITAL DUST INDICATOR AP-632. *(Earozoru no renzoku sokuteiki ni tsuite, dejitaru funjinkei AP-632). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):358, 1975. (Presented at the National Air Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 104.)*

A digital dust indicator, Model AP-632, by the Shibata Chemical Instrument Industrial Co., Ltd., is described. The model has been modified to meet the requirements imposed by JIS B-7954. The main modification is the use of semiconductors for the circuit from the previous Model A-632 of the tube system; they provide stabler continuous operation. The Model AP-632 employs a 40 C constant temperature bath to minimize the zero drift of the photomultiplier. The new model gives the measurement in one-minute integrated values with a 0.0001 mg/cu m sensitivity, and can also measure in one-hour integrated values.

59977 **APTIC NO. 81747**

Ogino, Hiroshi, Shigetaka Suzuki, and Takashi Araki

DEVELOPMENT OF CONTINUOUS MEASURING METHOD OF NITROGEN OXIDES BY CHEMILUMINESCENCE, NO. 2, BASIC STUDIES ON NOX CONTINUOUS MEASURING METHOD UTILIZING H-NO REACTION. *(Kagaku hakku o riyosuru chisso sankabutsu no renzoku sokuteiho no kaihatsu, dai 2-ho, H-NO hanno o riyo suru NOx no renzoku sokuteiho no kisoteki kento). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 210, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper 2D02.)*

Nitrogen oxides determination by the chemiluminescence method using atomic hydrogen is described. The reaction of hydrogen with nitric oxide and nitrogen dioxide yielded band spectra. The spectra were measured. The emission intensity was proportional to the NOx concentration, and the emission intensities originated from the NO and NO2 reactions were equal. The effect of carbon dioxide, carbon monoxide, sulfur dioxide, and methane on the NOx emission intensity was examined. The CO increased NOx emission intensity, while the other gases decreased the intensity.

59978 **APTIC NO. 83220**

Ogino, Hiroshi and Takashi Araki

ANALYSIS OF AIR POLLUTANTS WITH CHEMILUMINESCENT METHOD. *(Kagaku hakko ni yoru taiki osen gasu seibun no bunseki). Text in Japanese. Bunseki (Analysis), no. 12:804-810, 1975. 30 refs.*

The analysis of the composition of ambient pollutant gases by chemiluminescence methods was reviewed, including analysis of ozone, nitrogen oxides, and sulfur oxides. The continuous measurement method for ozone developed by Regener and an improoved method developed by Hodgeson which use pulverized silica gel and Rhodamine B are discussed. Other substances used for the continuous measurement of ozone are ethylene (for the method developed by Nederbragt) and an organic compound reported by Bowman. The nitrogen oxide analyzers discussed are the Fontijin nitric oxide detector which utilizes the reaction of nitric oxide with ozone, the Sigsby converter that changes nitrogen dioxide and trioxide to nitric oxide, the Black method which uses oxygen atoms, the Guicherit method which uses an ultraviolet ray, and the McClenny method which uses oxygen atoms obtained by the photo decomposition of nitrogen dioxide. Analytic methods for sulfur oxides developed by Goldenson, Kummer, and Pitts, are mentioned. The chemiluminescence method in general gives instant response and can detect an extensive range of gas concentrations.

59979 **APTIC NO. 84214**

Ohmichi, Sadao and Hikotaro Ida

COLLECTION AND DETERMINATION OF GASEOUS AND PARTICULATE FLUORIDES IN AMBIENT AIR. *(Taikichu no ryushijo, gasujo fukkabutsu no hoshu to bunsekiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):305, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 47.)*

The collection and analysis of gaseous fluoride compounds was studied. The collection method studied was a filter paper which was pre-treated with 1 to 10% sodium carbonate solution. The prepared filter paper was used to trap hydrogen fluoride gas. The HF collected on the filter paper was extracted with water, and was measured by the ion electrode method and the lanthanum-alizanine complex method. The detection limit of HF by both methods was 0.25 microliter HF. The HF trapping efficiency of the filter papers treated with 1% and 2% sodium carbonate solution was 89.6 to 96.8% and 90.7 to 94.9%, respectively. When the filter paper was pretreated with more than the concentration of 5% sodium carbonate solution, it affected the absorbance in the lanthanum-alizanine complex method. When the filter paper was pretreated with 10% sodium formate instead of sodium carbonate, it did not affect the absorbance; moreover, the filter paper gave better HF trapping efficiency, ranging between 96.5 and 98.1%.

59980 **APTIC NO. 82822**

Oikawa, Kikuo, Masami Fujii, and Yoshikazu Hashimoto

APPLICATION OF INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS FOR NASAN. *(NASA ni okeru hoshaka bunseki no jitsuyoka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):195, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 80.)*

The neutron activation analysis method for atmospheric metallic components was evaluated. The analysis procedure consists of sampling, sample preparation for irradiation, neutron irradiation by atomic reactor, gamma spectrum measurement using germanium (lithium semi-conductor) detector and automatic spectrum analysis and concentration calculation. The characteristic of this method is the suitability for simultaneous analysis of multi-components (30-50 elements); however, the accuracy is lower compared to that of atomic absorption spectrophotometry. In this study, suitable irradiation time and cooling time were experimentally evaluated for each group of elements. The accuracy and reproducibility were evaluated in comparison to the analysis results of common samples by other methods, in which analysis results of many elements were in good agreement with those obtained by fluorescent X-ray spectrometry and atomic absorption spectrophotometry.

59981 **APTIC NO. 80179**

Oishi, Tetsuo

DETERMINATION OF EQUIPMENT FOR SOOT AND DUST. *(Baijin ryo sokutei sochi). Text in Japanese. (Fuji Electric Co., Ltd. (Japan)) Japan. Model Util. Sho 50-26392. 3p., Aug. 6, 1975. 1 ref. (Appl. April 26, 1965, 1 claim).*

Equipment for the measurement of soot and dust by corona discharge is described. Gas is introduced to the equipment from the bottom part which has a water drainage. The gas leaving the gas inlet tube is led to a conical part where ionization electrodes are formed between a number of discharging needles and the inner surface of the conical casing. The charged particles are collected on the collecting electrode while the gas is ascending. Washing water is sprayed from nozzles surrounding the gas outlet tube on the top, and the particles on the collecting electrode are washed out. An ammeter is connected to the collecting electrode and the charge intensity released by the collected particles is measured to obtain the dust concentration.

59982 **APTIC NO. 83262**

Okamoto, Yonosuke

DETERMINATION METHOD OF SUSPENDED PARTICULATE IN CLEAN ROOM. *(Kurin rumu chu ni okeru fuyubiryushi no sokutei hoho ni tsuite). Text in Japanese. Kuki Seijo (Clean Air - J. Japan Air Cleaning Assoc., Tokyo), 13(5):61-72, Nov. 1975.*

The Japan Air Cleaning Association was commissioned by the Agency of Industrial Science and Technology to implement JIS standards for methods of measuring suspended particulate matter in clean rooms of hospitals and industrial cleaning processes. JIS standard (JIS B 9920) was recently established for both the microscopic method and the gauge method. The following details are discussed: definition of applicable methods, interpretation of idiomatic words, classification of measuring methods, microscope method, and a photodispersion gauge for particulate substances. Until now the standard of the American Society for Testing and Materials has been referred to when measuring airborne polluting particles, however the contamination control committee of Japan Air Cleaning Association has now finalized its own standard. The following matters are explained: the history of planning the original standard, inspection of an eye lens micrometer, measurement of the background for the filter which measures airborne particles, computation method, selection of a certain area of filter mesh for measurement, summary of a photodispersion gauge, operation of the particle gauge, calibration of the gauge, grades of cleanliness, and particle number concentration.

59983 **APTIC NO. 82182**

Omichi, Sadao

SAMPLING AND ANALYSIS OF ATMOSPHERIC SAMPLES. *(Taiki shiryo no saishu to bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):255, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975.)*

The sampling and analysis of airborne particulates by the relative concentration measurement methods, such as the digital dust counter and light scattering method; the weight concentration measurement methods such as high, middle, and low volume air samplers of various types; and the associated problems in standard particle generation apparatus, filter materials, and weighing methods are discussed.

59984 **APTIC NO. 83026**

Osberg, Thomas R., Robert A. Lewis, and John E. Taylor

A REMOTE SENSING STUDY TO DETERMINE ECOSYSTEM EFFECTS FROM STACK EMISSIONS FROM A POWER PLANT, COLSTRIP, MONTANA. *Preprint, Environmental Protection Agency, Warrenton, Va., Environmental Photographic Interpretation Center, National Ecological Research Lab., Corvallis, Oreg., and Montana State Univ., Bozeman, Mont., Dept. of Animal and Range Sciences, 7p., April 1975. 4 refs. (Presented at the Fort Union Coal Field Symposium, April 1975.)*

The use of remote sensing techniques to measure and predict the change in a grassland ecosystem as a function of air pollution in the vicinity of a coal-fired power plant located near Colstrip, Montana is described. Color, color infrared, and monochrome photographic techniques are being evaluated for assessing the effects of sulfur dioxide on field experimental plots. Sufficient resolution for most vegetation work appears possible with 70-millimeter color photography at a negative scale of 1:3000. High altitude photography ranging in scale from 1/35,000 to 1/80,000 is most suitable for the analysis of natural features in large areas as well as for mapping purposes. Low altitude flights which yield imagery with scales of 1/3000 to 1/44,500 are essential for obtaining detailed information on selected small targets on the ground. The recording of infrared signatures of individual plant species and plant communities is planned for future studies.

59985 **APTIC NO. 82059**

Oswin, Harry G. and Howard W. Bay

GAS DETECTOR UNIT. *(Energetics Science, Inc., Elmsford, N. Y.) U. S. Pat. 3,909,386. 9p., Sept. 30, 1975. 9 refs. (Appl. Sept. 11, 1972, 5 claims).*

An improved device for detecting and quantitatively measuring a select gas in a gaseous medium is described. The device is compact, dependable, easy to operate, rapid, and relatively inexpensive for detecting and quantitatively measuring a gas such as carbon monoxide, hydrocarbons, or an alcohol in an environment which is independent, or substantially independent of changes in temperature and humidity. The devices includes an electrochemical cell and incorporates temperature compensating circuitry which automatically and simultaneously adjusts for both the zero and span changes as a result of variation in temperature.

59986 **APTIC NO. 82552**

Ottaway, J. M. and D. C. Hough

CARBON FURNACE ATOMIC ABSORPTION ANALYSIS OF ATMOSPHERIC PARTICULATES. *Proc. Anal. Div. Chem. Soc., 12(12):319-321, Dec. 1975. 1 ref.*

A carbon furnace atomic absorption technique for the analysis of atmospheric particulates was developed and applied in a steelworks. Fifteen elements were monitored: arsenic, beryllium, cadmium, cobalt, chromium, copper, fluorine, mercury, manganese, molybdenum, nickel, lead, tin, vanadium, and zinc. The main sources of the dust emissions were the sinter plant, the open hearth steel making furnace, and the basic oxygen steel making furnaces. A high volume turbine blower mounted on the back of a van was used to collect the atmospheric particulate samples from various locations at the works. Particulates were collected from up to 17 cu m of air in 30 min and sample masses varying between 0.6 and 0.7 mg were collected on Whatman No. 41 filter papers. These were dissolved in nitric and perchloric acids. Acceptable results were obtained for Zn, Fe, Mn, Pb, and Cu.

59987 **APTIC NO. 80497**

Padnos, N. and E. F. Ferrand

COMPARISON OF INSTRUMENTAL METHODS FOR MONITORING OF NITROGEN DIOXIDE. *ISA (Instr. Soc. Am.) Trans., 14(3):248-254, 1975. 8 refs. (Presented at the Instrument Society of America International Instrumentation-Automation Conference and Exhibit, New York, Oct. 28-31, 1974.)*

The national primary and secondary ambient air quality standard for nitrogen dioxide is 0.05 ppm annual arithmetic mean. To determine compliance with this standard, it is necessary to be able to measure accurately concentrations of this order of magnitude of nitrogen dioxide in air. This represents the basic performance specification for a nitrogen peroxide analyzer for ambient air monitoring. Instrumentation is discussed including colorimetry, chemiluminescence analyzers, spectroscopic methods, and coulometric analyzers. Two chemiluminescence nitrogen oxides monitors from different manufacturers were operated side by side for a week. Their behavior when monitoring ambient air, their zero drift, span drift, and noise level, were compared. Noise was estimated visually from the width of chart traces, especially during zero and span measurements. Data are given for zero checks, chemical zero, and span checks. Nitric oxide is apparently either a positive interferent in the NO2 determination by Instrument B or a negative interferent in the NO2 by Instrument A.

59988 **APTIC NO. 82745**

Paley, Louis R., Mark Antell, Victor W. Hanson, and Richard J. Powals

WERE THE MEASURED EMISSION RATES REPRESENTATIVE OF A COKE BATTERY S TYPICAL EMISSIONS? *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 19p., 1975. 5 refs. (Presented at the Air Pollution Control Association, East Central Section Meeting, 32nd, Dayton, Ohio, Sept. 17-19, 1975.)*

Procedures used to determine whether measured particulate emission rates were representative of the actual particulate emissions generated from the coke side of a coke battery are outlined. The procedures included: defining the acceptable range (within + or - 10%) of the critical process conditions which were required to achieve the primary goal of the test program, documenting that the tests were performed only during acceptable process conditions, taking specific precautions to insure that the results were representative of the emissions during the test period, and documenting that the results were representative of the emissions during the test. Each of three pairs of concurrent particulate tests in the coke shed s exhaust duct was conducted to individually represent the continuous (combined push, quench car, and door leak emissions) shed emissions and the 3-minute peak (push and quench car) emissions. Fugitive particulate emissions from the coke shed were sampled anisokinetically using a sampling train composed of a straight nozzle, filter, critical orifice, and pump. A total of 14 fugitive emission samples were acquired, providing a good basis for estimating the shed leak particulate emission rate.

59989 **APTIC NO. 80775**

Parsons, James S. and Stanley Mitzner

GAS CHROMATOGRAPHIC METHOD FOR CONCENTRATION AND ANALYSIS OF TRACES OF INDUSTRIAL ORGANIC POLLUTANTS IN ENVIRONMENTAL AIR AND STACKS. *Environ. Sci. Technol., 9(12):1053-1058, Nov. 1975. 13 refs.*

A simplified quantitative method is described for the collection of air pollutants on a porous polymer trap, for heat desorption onto a column, and for analysis by gas chromatography. Procedures, including preparation of traps and calibration, are described. The method has been applied to a number of volatile industrial substances from stacks and ambient air such as aromatics, alcohols, ketones, acids, nitro, chloro, amino, and sulfur compounds.

59990 **APTIC NO. 76362**

Peck, E. S.

SPECTROGRAPHIC DETERMINATION OF MERCURY IN ROCKS AND COAL. *Anal. Chim. Acta, vol. 80:75-83, Nov. 1975. 49 refs.*

An optical emission spectrographic method for the determination of 5-1000 ppb mercury in rocks and coal is described. The method is applied to United States Geological Survey rocks and National Bureau of Standards coal standards. Little or no sample preparation is required, which makes the procedure simple and rapid. The Standard deviation is 30%. (Author summary)

59991 **APTIC NO. 80464**

Pellizzari, Edo D., Ben H. Carpenter, John E. Bunch, and Eugene Sawicki

COLLECTION AND ANALYSIS OF TRACE ORGANIC VAPPOR POLLUTANTS IN AMBIENT ATMOSPHERES. THERMAL DESORPTION OF ORGANIC VAPORS FROM SORBENT MEDIA. *Environ. Sci. Technol., 9(6):556-560, June 1975. 21 refs.*

A thermal desorption gas-liquid chromatography interface is described for recovering hazardous substances concentrated on sorbents in glass cartridges. The interface consists of a desorption chamber, a six-port two-position high temperature low volume valve, a nickel capillary trap, and a temperature controller. The temperature rise time is determined in the center of cartridges for several sorbents. The heating rates were: PCB and BPL activates greater than oxopropionitrile and Carbowax 400 chemically bonded to Proacil C greater than Chromosorb 104 greater than Tenax GC greater than Chromosorb 101. The heating rate was linear for all sorbents up to 65% of the set desorption chamber temperature (60-90 sec) and required several minutes thereafter to reach the final temperature. The recovery of several hazardous vapors adsorbed on Tenax GC using thermal desorption was equal to or greater than 90% at the 50 and 100 ng level. (Author abstract modified)

59992 **APTIC NO. 83346**

Pellizzaro, Edo D., John E. Bunch, Ben H. Carpenter, and Eugene Sawicki

COLLECTION AND ANALYSIS OF TRACE ORGANIC VAPOR POLLUTANTS IN AMBIENT ATMOSPHERES. TECHNIQUE FOR EVALUATING CONCENTRATION OF VAPORS BY SORBENT MEDIA. *Environ. Sci. Technol., 9(6):552-555, June 1975. 33 refs.*

An analytical technique for evaluating the collection efficiencies of sorbents during the concentration of hazardous vapors from a flowing stream is described. The polymeric beads, Tenax GC, Porapak Q, Chromosorb 101, and Chromosorb 104, were equal to or greater than 90% efficient in trapping vapors of epoxides, beta-lactones, sulfonates, sulfones, N-nitrosamines, chloroalkyl ethers, aldehydes, and nitro compounds from synthetic air-vapor mixtures at 0.25 l/min. Tenax and Chromosorb 101 were evaluated at sampling rates up to 9 l/min and maintained efficiencies equal to or greater than 90%. Carbowax 600 and 400 and oxypropionitrile coated or chemically bonded to supports were highly efficient (greater than 90%). (Author abstract modified)

59993 **APTIC NO. 82781**

Pijanowski, B. S.

THE MEANING AND MEASUREMENT OF TURBIDITY. *Preprint, National Oceanic and Atmospheric Administration, Rockville, Md., National Oceanographic Instrumentation Center, 11p., 1975. 13 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 1975.)*

The concept of turbidity is reviewed along with methods for its measurement. Turbidity is an optical concept and in a broad sense is an indication of suspended particulate matter. A single optical measurement generally cannot be used to measure suspended particulates because the optical characteristics of the particulates are complex functions of particle size and shape, absorption, and other properties. Instruments used for obtaining turbidity information include: transmissometers, nephelometers, and ambient light meters. Transmissometers measure transmittance or the amount of light transmitted from a source along a straight line. Nephelometers measure light that is scattered in some direction from a source as a result of suspended particles in the light path. Ambient light measuring instruments differ from transmissometers and nephelometers in that they measure light energy resulting from global radiation rather than from some artificial light source.

59994 **APTIC NO. 84063**

Pischinger, A., E. Huttmann, G. Krassnig, and H. Nigsch

METHODS FOR OBTAINING AN EMISSION INVENTORY FOR TRAFFIC IN A RESIDENTIAL AREA. *(Verfahren zur Ermittlung des Abgaskatasters fuer den Strassenverkehr in einem Siedlungsgebiet). Text in German. Oesterr. Ing.-Z., 18(12):435-442, Dec. 1975. 1 ref.*

Two methods for determining exhaust gas emissions from motor vehicles in traffic are discussed. In the May-Plassmann technique, traffic activity is subdivided into seven different ranges of speed for selected cars and trucks tested at driving stations for quantifying exhaust emission/unit of time. The refined May-Plassmann technique and the Graz method are based on driving diagrams from a motor vehicle in traffic. In the former method the average speed between two points of a measured strip is determined as 6-100 km/hr by linear interpolation and 6 km/hr-2 km/hr by extrapolation. In the Graz method, the activity ranges lying between two points are divided into individual driving strips with specific emission coefficients for acceleration, deceleration, and constant speed analyzed by flame ionization detection and infrared absorption spectrometry. Traffic congestion and its influence on the environment and fuel consumption are considered with respect to the layout of streets.

59995 **APTIC NO. 83913**

Podolskiy, A. A., L. M. Logvinov, A. F. Voronov, and W. W. Fadeev

AEROSOL PARTICLE COUNTER MODEL EIP-9. *(Stchetchik aerozolnikh tchastits EIP-9). Text in Russian. Prib. Tekh. Eksp., 19(5): 259, Sept.-Oct. 1975.*

An instrument for measuring the distribution of aerosol particles 1-2, 2-5, 5-10, 10-20, 20-40, and 40-80 micrometer in size and larger is described. It works on the principle of forming signals proportionate to the surface of the aerosols and subsequent registration via different channels depending on the amplitude of the impulses. Air samples are measured photoelectrically for particles larger than 10 micrometer and inductometrically based on the charging of particles in the field of the discharge corona and subsequent inductive measurement of the transmitted charges. The induction line is less sensitive than the photoelectric one. Through the latter air flows at a rate of 1 l/min, through the former, at 5 l/min in order to raise the statistical reliability of the measurements. The instrument works manually or could be programmed. In the latter case, it works cyclically. Each cycle consists of separately determined intervals for air sampling (1, 3, 5 l/min. pumped through the measuring line and 2,5, 10 min intervals). The results of the distribution of aerosol particles are transferred on a punch-card machine are visually read from a 6-digit signal panel.

59996 **APTIC NO. 75981**

Purdue, L. J., G. G. Akland, and E. C. Tabor

COMPARISON OF METHODS FOR DETERMINATION OF NITROGEN DIOXIDE IN AMBIENT AIR (FINAL REPORT). *Environmental Protectection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab., Program Element 1HA326, ROAP 22ACK, Rept. EPA-650/4-75-023, 95p., June 1975. 8 refs.*

NTIS: PB 245025/AS

Ambient nitrogen dioxide measurements were made concurrently using four different methods to determine the intramethod and intermethod comparability of the data generated under a variety of carefully controlled conditions. The methods comprised two manual chemical techniques and two automated techniques (chemiluminescence and colorimetry). Simultaneously nitrogen dioxide measurements were made on a common air source using duplicate analyzers for each of the automated methods and quadruplicate samples for each of the manual methods. The average difference between any of the methods was never greater than 0.004 ppm, and in all cases variability of the differences among the four methods was only slightly higher than the variability within each method. The colorimetric method yielded low results in the presence of high ozone concentrations; the other methods were not affected by ozone.

59997 **APTIC NO. 79824**

Ragaini, R. C., H. R. Ralston, D. Garvis, and R. Kaifer

TRACE ELEMENTS IN CALIFORNIA AEROSOLS. PART 1. INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS TECHNIQUES (FINAL REPORT). *California Univ., Livermore, Lawrence Livermore Lab., Energy Research and Development Administration Contract W-7405-Eng-48, 38p., June 18, 1975. 10 refs.*

NTIS: UCRL-51850

Instrumental Neutron Activation Analysis (INAA) was used in the California Aerosol Characterization Experiment from 1972 to 1974 to measure elemental diurnal variations and to determine elemental particle size distributions. The method is described. A secondary role of INAA was the validation of other analytical techniques utilized in the chemical analysis of aerosols. Techniques using INAA were useful operational methods for chemical analysis of aerosols collected over 2-hour periods in urban air with an active monitoring program. (Author abstract modified)

59998 **APTIC NO. 83312**

Reagan, Paul E.

DEVICE FOR SAMPLING EXHAUST STACK EFFLUENT. *(Energy Research and Development Administration, Washington, D. C.) U. S. Pat. 3,885,437. 4p., May 27, 1975. 1 ref. (Appl. Feb. 26, 1974, 3 claims).*

A device for sampling effluent discharged into the atmosphere from dry exhaust stacks is described. The effluent gathering probe is capable of obtaining representative samples of the total effluent exhausted through the stack. The probe travels on two axes in a cross sectional plane of the stack so as to move the probe in a spiral path across the radius of the stack to obtain homogeneous samples of the exhaust emissions. The improvement of this apparatus over the prior art involves an arrangement wherein the probe is moved across the radius of the conduit while being rotated about the longitudinal axis of the conduit so as to generate a sample gathering path defined by an archimedean spiral. (Author abstract modified)

59999 **APTIC NO. 79776**

Rehme, Kenneth A. and Frank P. Scaringelli

EFFECT OF AMMONIA ON THE SPECTROPHOTOMETRIC DETERMINATION OF ATMOSPHERIC CONCENTRATIONS OF SULFUR DIOXIDE. *Anal. Chem., 47(14):2474-2477, Dec. 1975. 22 refs.*

The magnitude of the interference of ammonia on the colorimetric determination of sulfur dioxide using the accepted reference method was evaluated. The effect of aqueous NH_3 on the analytical procedure was determined and the interference of gaseous NH_3 under various humidity conditions was evaluated. Permeation tubes were used as sources of both

SO2 and NH3 to prepare known concentrations of each pollutant at realistic atmospheric levels. Ammonia is not a significant interferent in the colorimetric determination of SO2. Observed interferences are not characteristic of the analytical procedure set for in the reference method for SO2 and result from losses of SO2 in the intake manifold by gas-phase reaction with NH3. These reactions should occur naturally in ambient air and NH3 should not be classified as an interferent under these conditions. (Author conclusions modified)

60000 **APTIC NO. 76528**

Rhodes, D. F.

MEASURING FLOW WITH RADIOTRACERS. *Instrum. Technol., 22(10): 43-48, Oct. 1975. 10 refs.*

The use of radiotracers to measure flow rate on-line in refineries is discussed. The capabilities and limitations of three types of radioatracer measurements are summarized: total count, two-point, and continuous sample. The radiotracer is a totally unique material in the system and the penetration of radiation through piping enables measurements with external detectors which do not interrupt or disturb normal flow conditions. It provides an accurate and precise means of making an instantaneous measurement for such purposes as the checking of low flowmeter calibration. Leaks can be located and the flow of material into improper channels can be determined as well. Radiotracers were applied to tracing a leak in a desulfurization unit.

60001 **APTIC NO. 80154**

Rosen, H., P. Robrish, and O. Chamberlain

REMOTE DETECTION OF POLLUTANTS USING RESONANCE RAMAN SCATTERING. *Appl. Opt., 14(11):2703-2706, Nov. 1975. 35 refs.*

The remote detection of pollutants using resonance Raman scattering is described. Calculations of the resonance Raman cross section for several diatomic molecules are presented. These results are used, together with recent measurements of large resonance enhancements in nitrogen dioxide and sulfur dioxide, to estimate the sensitivity of a lidar systems based upon the resonance Raman effect. A useful measure of the sensitivity of the lidar system is obtained by considering the signal to noise ratio (SNR). Technological assumptions are made that are at the limits of present capability and are balanced by requiring the system to meet strict eye safety standards and to give a measurement of pollutant concentration accurate to 10% with a range resolution of 10 m. (Author abstract modified)

60002 **APTIC NO. 76634**

Rudenko, N. M. and V. L. Evdokimov

CLASSIFICATION OF METHODS FOR THE DETERMINATION OF THE ATMOSPHERIC MICROFLORA. *(Klassifikatsiya metodov opredeleniya vozdushnoy mikroflory). Text in Russian. Gigiena i Sanit., no. 7:97-100, 1975. 17 refs.*

An original classification of aeromicrobiological samplers is presented. Class I includes samplers for the determination of the count of aerosol particles carrying microorganisms. These samplers can operate on the basis of inertial impaction, precipitation in electrical or thermal fields, retention on filters, or electrical counting. Samplers of Class II are used to determine the total concentration of microorganisms in a unit volume of air, utilizing inertial impaction in liquids or on solid surfaces, bubbling through liquids, and retention on soluble or insoluble filters. Combined methods utilizing different mechanisms for the capture of microorganisms are referred to class III. It is unacceptable to compare results obtained by means of samplers belonging to different classes.

60003 **APTIC NO. 79773**

Russell, John W.

ANALYSIS OF AIR POLLUTANTS USING SAMPLING TUBES AND GAS CHROMATOGRAPHY. *Environ. Sci. Technol., 9(13):1175-1178, Dec. 1975. 4 refs.*

A procedure for the analysis of air pollutants using sampling tubes and gas chromatography is described. Sampling tubes filled with gas chromatographic packings are excellent for concentrating organic pollutants from air. The collected pollutants are thermally desorbed into a gas chromatograph and quantitated using flame ionization or flame photometric detection. Advantages of the technique are ppb sensitivity and quantitative recovery, as well as superior sample stability and sampling convenience. The suitability of various sampling tube packings for collecting specific compounds is shown by determination of breakthrough volumes and recovery values. (Author abstract modified)

60004 **APTIC NO. 82130**

Rusz, Tibor and Elliott Jacobson

DYNAMIC GAS ANALYZER. *(Assignee not given.) U. S. Pat. 3,913,379. 7p., Oct. 21, 1975. 5 refs. (Appl. Oct. 18, 1973, 9 claims).*

A dynamic gas analyzer that determines the composition of a gas by monitoring its thermal conductivity is described. The analyzer s response time is much shorter than that of prior art designs. An analog electrical signal having a base level or substantially static magnitude during each no flow interval is generated in response to the thermal conductivity of the gas being analyzed. This static magnitude is digitally sampled and held, indicating the composition of the gas. An application of the analyzer is the measurement of nitrous oxide in an anesthetized patient on a real time basis.

60005 **APTIC NO. 83959**

Ryabtsev, B. I.

PORTABLE DUST SAMPLER. *(Portativnoe ustroystv dlya otbora prob pyli). Text in Russian. Gigiena i Sanit., no. 8:49-51, 1975.*

Two new portable and autonomous dust samplers, developed especially for dust sampling in moving objects, are described. Both work on the suction principle, and the necessary vacuum is generated by a small-size electric motor powered from board power supply or from batteries. One sampler has an analytical filter type FP with an effective surface area of 10 sq cm, and the other is equipped with a filter element in the form of a hollow truncated cone. Both samplers are equipped with timer and flowmeter.

60006 **APTIC NO. 80498**

Saito, H., K. Kawamura, K. Fushimi, H. Sato, A. Ono, T. Ito, M. Misaki, I. Kanazawa, M. Ikegami, N. Yano, T. Sekihara, K. Murai, M. Kobayashi, T. Yamauchi, and R. Goto

STUDY ON MRI MONITORING SYSTEM FOR GLOBAL BACKGROUND AIR POLLUTIONS OF PARTICULAR SIGNIFICANCE TO WEATHER AND CLIMATE. *(Kiko ni eikyo suru taiki osen busshitsu no sokuteiho oyobi sono kanshi no shisutemu ka ni kansuru kenkyu). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 10(6):49-66, Nov. 1975.*

Prototype monitoring systems for use in a global network of baseline air pollution stations are described. There are automated instruments for measuring low concentrations of nitrogen oxides and sulfur dioxide in the air at a rate of once/6 hr. An automatic aerosol particle counter was developed in which the concentration of aerosol particles with radii between 10 to the -7th and 10 to the -5th power cm can be determined at any desired interval of time down to 2 min. A radiosonde for measuring the concentration of aerosol particles higher than 0.3 micron in diameter was developed. The flow characteristics of the high volume aerosol sampler which was developed for collecting large amount of aerosol particles to detect constituent elements by the neutron activation analysis was determined with a standard flow meter under various sampling time intervals. A method was developed for chemical testing for individual atmospheric aerosol particles of mass down to 10 to the -16th power g. A spectro-pyrheliometer was designed for the measurement of the atmospheric extinction coefficient due to scattering by atmospheric aerosol particles. The present atmospheric level of submicron aerosol particles was measured in Chichi-jima and Marcus Island with an aerosol particle counter. The region was pollution free.

60007 **APTIC NO. 82945**

Saito, Koichi, Tatsuya Saijo, Eiji Ebisawa, and Katsuhisa Taguchi

SAMPLING METHOD OF PHENOL WITH FILTER PAPER, PART 1. *(Roshi ni yoru fenoru no sampuringu ho ni tsuite, dai 1-po). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):325, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 68.)*

A phenol gas sampling method using a 12.6 sq cm Gelman-A glass fiber filter was studied. The filter was treated by soaking in a 10% sodium hydroxide solution, and the dried filter was used to trap phenol gas. The trapping efficiency of 25 liter 8 ppm phenol by the treated filter was 100% regardless of the flow rate up to 30 l/min. The average recovery of phenol trapped on the filter by 50 ml water was 99%. The filter with trapped phenol was stable over 3 to 4 days if it was placed in a polyethylene bag and stored in a soda lime desiccator. With this sampling method and colorimetric determination by 4-aminoantipyrine, 0.05 to 0.1 ppm level phenol could be determined.

60008 **APTIC NO. 82198**

Saito, Osamu, Hajime Asami, and Kenichi Kawado

MEASUREMENT OF NON-METHANE IN AMBIENT AIR BY THE SELECTIVE COMBUSTION METHOD. *(Sentaku nenshohoshiki ni yoru taikichu no himetan no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):309, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 51.)*

A selective non-methane hydrocarbons analyzer by Horiba Manufacturing Co. is described. The analyzer was equipped with a flame ionization detector and employed a selective combustion tube for non-methane hydrocarbons. The combustion tube contained alumina loaded with noble metals such as platinum and palladium which selectively absorbed non-methane hydrocarbons, which combusted due to the high temperature of the tube, while methane was not absorbed within the tube or detected by the FID. At a tube temperature of 170 C, a 100% combustion efficiency could be obtained for the hydrocarbons except methane, ethane, and propane. The combustion efficiency of propane was more than 99%, and that of ethane was 85 to 95%. In order to improve the combustion efficiency of the latter two compounds, two of the combustion tubes were used in series and 1 to 2% water was added to the system. With these conditions, methane combustion occurred; however, it was constant from 9.0 to 11.0%, which was electrically compensated for. Without passing the sample gas through the combustion tube, rather with passing the gas to the FID directly, total hydrocarbon were detected. The analyzer utilized the alternating sample gas flow lines to detect both total hydrocarbons and methane separately, and two signals were electrically subtracted to give the non-methane hydrocarbon level as the analyzer output. The correlation factor between non-methane hydrocarbon analysis by this analyzer and the Beckman 6800 analyzer was 0.986.

60009 **APTIC NO. 82201**

Sakimoto, Michio and Akio Miyazaki

DETERMINATION OF AMMONIA IN THE ATMOSPHERE. *(Taikichu no anmonia no sokutei ni tsuite). Text in Japanese. Osakafu Norin Gijutsu Center Kenkyu Hokoku (Bull. Osaka Prefect. Agric. Res. Cen.), no. 12:163-167, July 1975. 4 refs.*

A simple method for ammonia gas determination was studied by trapping ammonia with 1/50 N sulfuric acid. The standard ammonia gas was generated by adding 5% sodium hydroxide solution to ammonium sulfate solution. The generated ammonia was sucked through a wash bottle containing sulfuric acid at the rate of 1, 2, 3, and 5 l/min, and the ammonia in the absorbing solution was determined by two different colorimetric methods; pyridine- pyrazole and indophenol. Both methods gave linear calibration curves for ammonia up to 40 microgram; the former method gave a smaller blank value and more stable color intensity than the latter method. The trapping efficiency for 30 microgram ammonia by 10 ml sulfuric acid solution was 59.1% and 93.7% at suction speeds of 1 and 2 l/min respectively. A 100% trapping efficiency could be obtained with a suction speed greater than 3 l/min. The detection limit by the method was 0.04 ppm ammonia with the collection of a 25 l air sample. The indophenol method with the above collection technique was used to determine the atmospheric ammonia level near stall barns; ammonia levels ranging from 0.05 to 12.2 ppm could be determined by absorbing a 25 l air sample.

60010 **APTIC NO. 75979**

Saltzman, Bernard E.

DEVELOPMENT OF AIR SAMPLING METHODOLOGY (FINAL REPORT). *Cincinnati Univ., Cincinnati, Ohio, Dept. of Environmental Health, Environmental Protection Agency Grant 800869, Program Element 1A1010, ROAP 26ACX-37, Rept. EPA-650/2-75-067, 41p., May 1975. 6 refs.*

NTIS: PB 245026/AS

Solid absorbent systems were developed for the analysis of nitrogen dioxide, reactive hydrocarbons, and vinyl chloride. Nitrogen dioxide was sampled with small glass tubes packed with copper shot. These tubes were appropriate for personal sampling and showed a storage life prior to analysis of up to 5 wk. Reactive hydrocarbons were determined in a dual analyzer as the concentration absorbed on chromium trioxide-sulfuric acid. This measurement technique appeared to correlate better with photochemical reactivity than techniques for measuring non- methane hydrocarbons. Permeation tubes for vinyl chloride were successfully used to optimize the carbon tube sampling method. Time patterns of monitoring data were examined by Fourier analysis on a computer. (Author abstract modified)

60011 **APTIC NO. 76371**

Saltzman, Bernard E., William R. Burg, and John E. Cuddeback

CONTINUOUS MONITORING INSTRUMENT FOR REACTIVE HYDROCARBONS IN AMBIENT AIR. *Anal. Chem., 47(13):2234-2238, Nov. 1975. 18 refs.*

A continuous monitoring instrument was developed for reactive hydrocarbons in ambient air. Metered sample air flows are continuously pumped through an empty column and an absorbent column arranged in parallel. The air stream exiting from each column is directed alternately in a 5-minute cycle by a switching valve to the flame ionization detector for quantitative measurements. A chromium trioxide sulfuric acid packing is optimal to absorb olefinic and higher aromatic hydrocarbons, and suitable column dimensions, flow rates, and temperatures are determined to obtain desired separations. Reactive hydrocarbon concentrations, obtained by difference from the instrument recordings, are reported for Cincinnati. (Author abstract modified)

60012 **APTIC NO. 82803**

Sasaki, Toshio, Toyoko Nonomura, and Susumu Takada

EFFECTS OF SULFUR DIOXIDE IN ATMOSPHERE ON GLASS FIBER FILTERS. *(Ryushijo busshitsu sokuteikoki no garasu seni roshi ni oyobosu taikichu nisankaiou no eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):332, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 75.)*

Measured values of suspended particulates collected by low-volume air samplers varied with the type of glass fiber filters. Using five types of glass fiber filters (Toyo Filter GB 100 and GB 100R, Wattman GF/C, Milipore AP 20, Gelman A) and two other filters as references (Toyo Filter 5A and Fuji microfilter FM 300), suspended particulates, sulfate, and nitrate concentrations in atmospheric samples were measured and compared. The sulfate concentration was also measured by exposing wet filters to sulfur dioxide using experimental apparatus. Mean measured values varied in the range of 52.5-83.2 microgram/cu m for suspended particulates, 8.4-37.2% for sulfate and 3.3-5.4% for nitrate. In the SO2 exposure experiment, the mean weight gain of filter varied in the range of 0.27-8.03 mg/sheet, while sulfate concentrations varied from 0.01-13.68 mg/sheet. Mean values of suspended particulates and sulfate concentrations in the atmospheric samples were higher using GB 100 and GB 100R. The SO2 exposure experiment showed a similar tendency, which was considered to be due to a high alkali content in these filters. The nitrate concentration varied little with the type of filter.

60013 **APTIC NO. 84182**

Sato, Kenji, Mitsuru Hoshino, Yoshimatsu Odate, Masayoshi Minakami, Fusamune Suzuki, and Shuji Iitoyo

SAMPLING OF FLUORIDES IN STACK GAS WITH THE LIME-TREATED FILTER PAPER METHOD, II. *(Arukari roshi o mochiiru endo haigasu chu no fukkabutsu no sanpuringu ni tsuite, sono 2). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):303, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 45.)*

The use of alkaline filter paper for the collection of fluoride compounds in flue gas was studied. Toyo filter paper No. 51A, 40 mn diameter, was treated with 5% sodium carbonate solution and dried. In a filter holder, two of the alkaline filter papers prepared were placed in series after a teflon filter to remove dust, then flue gas was sucked through the holder. The collection efficiency for fluoride compounds by two alkaline filter papers were more than 90%. The alkaline filter paper method was compared with the impinger method. Both methods were used to collect fluoride compounds from the same flue gas. The alkaline filter paper method collected more fluoride compounds than the impinger method. With the same flue gas flow rate of 1.7 l/min, the alkaline filter paper method gave 0.19 mg fluoride/N cu m, while the impinger method gave 0.12 mg/N cu m.

60014 **APTIC NO. 82954**

Sato, Yoshiharu, Toshio Oiwa, Akira Seino, Katsuhiro Osaki, and Keisa Hoshina

EVALUATION OF AIR POLLUTION WITH DUST-FALLS. *(Kokabaijin ni yoru taiki osendo no hyoka ni tsuite ni ichikosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):598, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 1.)*

The Yamagata Prefectural Environmental Pollution Center investigated the effects of windblown salt on quantitative analysis of dust deposition. Seasonal changes and the locality were surveyed to evaluate a method to determine air contamination intensity by measurement of dust deposition. The deposit gauge method was used to sample dust deposition at the shorelines of the Japan Sea and the inland basin during April 1974 to March 1975. The soluble substances of the sampled dust were analyzed, including chlorine, sodium, sulfate, and manganese (listed by decreasing order of magnitude in sea water). The correlation coefficient indicates that many correlations exist in spite of some regional differences, especially the correlation of Na and Cl in both areas. The percentage of the Na Cl detected in both areas were similar to the percentage of Na and Cl contained in sea water. In the littoral area, the effect of wind-blown salt is 0.5 tons/sq km/mo in summer and 10 tons/sq km/mo in winter; inland it is, 0.2 tons/sq km/mo and 0.8 tons/sq km/mo respectively.

60015 **APTIC NO. 84068**

Sato, Yasuhito and Isao Mizoguchi

COMPONENT ANALYSIS OF SUSPENDED PARTICULATE MATTERS IN THE ATMOSPHERE BY EDX. *(Taikichu fuyu funjin no EDX ni yoru sosei bunseki). Text in Japanese. Tokyo-toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rept. Tokyo Metrop. Res. Lab. Public Health), 26(1):272-276, 1975. 18 refs.*

A combined system of electron microscope and energy dispersive X-ray analyzer (EDX) was applied to the component analysis and observation of particle shape and size of suspended particulates, and measurement conditions were evaluated. Descriptions of sampling method (800-1000 A collodion film) and electron microscope and EDX system are given with block diagram. The use of carbon film for the purpose of fortifying collodion film had a shadowing effect and was unsuitable for particulate observation. The EDX spectrum of components with characteristic X-ray energy of less than 10 KeV was readily obtained. In suspended particulates collected in Tokyo, sulfur, silicon and chlorine were found most commonly. Particulates larger than 1 micron generally comprised several types of elements.

60016 **APTIC NO. 81922**

Scheide, Eugene P. and John K. Taylor

A PIEZOELECTRIC CRYSTAL FILM BADGE FOR MONITORING MERCURY IN AIR. *Am. Chem. Soc. Div. Environ. Chem. Prepr., 15(2):36-39, 1975. 3 refs. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 170th, Chicago, Ill., Aug. 24-29, 1975.)*

A piezoelectric crystal sensor for the personal monitoring of airborne mercury in occupational environments is described. The device is small enough to be worn on a worker s clothing and operates on the gravimetric principle. The mass of material deposited or adsorbed onto it is determined by measuring its change in frequency. By applying a substrate to the crystal that allows selective adsorption of the contaminant, the total exposure to this contaminant is determined from a calibration chart by measuring the frequency change of the crystal and the time of the sampling period. A piezoelectric sensor using gold as the selective substrate in conjunction with a miniature personal pump can be used to measure total exposure to mercury for a given time period. The device is sensitive to the nanogram range.

60017 **APTIC NO. 76628**

Schleusener, Stuart A., James D. Lindberg, and Kenneth O. White

DIFFERENTIAL SPECTROPHONE MEASUREMENTS OF ABSORPTION OF LASER ENERGY BY ATMOSPHERIC DUST. *Appl. Opt., 14(11):2564-2565, Nov. 1975. 13 refs.*

A new method of measuring atmospheric particulate absorption using a differential spectrophone system was tested. Initial results are obtained in the 9 and 10 micron wavelength regions. The differential spectrophone reduces window signals and is used to obtain increased sensitivity. A tunable carbon dioxide laser is used as the source. The system has two advantages: extremely high sensitivity useful for dilute samples and low absorption coefficients and the ability to separate absorption losses from scattering losses. Substrate and window absorption equilibrium responses are as much as 20-30 seconds for this system.

60018 **APTIC NO. 84131**

Schoeck, Werner

MEASURING RANGE LIMITS AND RESOLUTION POWER OF OPTICAL PARTICLE SIZE SPECTROMETERS. *(Messbereichsgrenzen und Aufloesungsvermoegen bei optischen Partikelgroessenspektrometern). Text in German. Institut fuer Angewandte Systemtechnik und Reaktorphysik Kernforschungszentrum, Karlsruhe (Federal Republic of Germany), Aerosol Meas. Technol. Colloq., Aachen, West Germany, 1975, p. 45-58. 4 refs. (March 4, 1975.)*

A method to calibrate and to determine the detectable limits of optical particle-size spectrometers is described. Based on the Mie-Theory, this procedure permits a more rapid and accurate operation than experimental calibration with spherical test aerosols. A theoretical calibration method of this kind can only be applied in those cases where spherical particles with well-known optical properties are involved. In the measurement of polydisperse aerosol-size spectra, calculated analytical functions help to calibrate optical spectrometers. The absolute terms of the calibrating functions make a projection of the lower physical detectable limits of the instrument possible, which can be experimentally verified. The practical lower limit of the measuring range was determined by the resolving power required in each case and provided by somewhat larger particle diameters.

60019 **APTIC NO. 76476**

Schuetzle, Dennis, Thomas J. Prater, and Susan R. Ruddell

SAMPLING AND ANALYSIS OF EMISSIONS FROM STATIONARY SOURCES I. ODOR AND TOTAL HYDROCARBONS. *J. Air Pollution Control Assoc., 25(9):925-932, Sept. 1975. 9 refs. (Presented at the Engineering Foundation Conference, Pacific Grove, Calif., April 10, 1974.)*

Odor and hydrocarbon concentration measurements were used to evaluate procedures for sampling organic emissions from stationary sources. Odor measurements are most sensitive to changes in chemical character since the most polar gases are highly susceptible to adsorptive effects. Dynamic dilution of emissions before collection in eight liter Tedlar bags minimizes the loss of organic components during storage. The dilution ratio is dependent upon the quality, quantity, and temperature of the organic emissions. Odor and hydrocarbon measurements were made at the sampling site and compared to measurements made in the laboratory. Both syringe and dynamic dilution techniques were compared at the site and in the laboratory. The syringe technique is highly susceptible to losses of material. Emissions from paint spray booths and paint bake oven were used to test the techniques. (Author abstract modified)

60020 **APTIC NO. 82648**

Seals, R. K., Jr. and B. J. Peyton

REMOTE SENSING OF ATMOSPHERIC POLLUTANT GASES USING AN INFRARED HETERODYNE SPECTROMETER. *Preprint, National Aeronautics and Space Administration, Hampton, Va., Langley Research Center and Cutler Hammer, Melville, N. Y., 8p., 1975. 28 refs. (Presented At the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Remote sensing of the concentration and vertical distribution of atmospheric gases using an infrared heterodyne spectrometer (IHS) was investigated, and a dual carbon dioxide laser multichannel IHS was developed for ground-based and airborne measurements of tropospheric gases. Analyses of nadir thermal radiance measurements from a 10-kilometer platform and solar absorption measurements made from the ground indicated that initial applications of the IHS to tropospheric measurements of ammonia and ozone are feasible with precisions ranging from 0.5-2 ppb and 20-30 ppb, respectively. These analyses included the effects of potential retrieval error sources and resulted in the specification of measurement modes, optimum signature lines, required system parameters, and expected sensitivities. (Author summary modified)

60021 **APTIC NO. 82834**

Sehmel, George A.

PARALLEL POINT TO PLANE ELECTROSTATIC PRECIPITATOR PARTICLE SIZE SAMPLER. *(Atomic Energy Commission, Washington, D. C.) U. S. Pat. 3,879,986. 6p., April 29, 1975. 11 refs. (Appl. Oct. 5, 1973, 4 claims).*

An electrostatic precipitator for precipitating particulate matter within a fluid onto a grid is described. An elongated electrode with a sharpened point is positioned with its long axis in spaced-apart relationship parallel to the grid with the grid and electrode in a chamber of a housing. A high voltage is imposed between the grid and the electrode sufficient to cause a corona discharge from the electrode which precipitates the particulate matter from the fluid onto the grid. Unlike in other devices, there is a minimal premature particle separation. (Author abstract modified)

60022 **APTIC NO. 83156**

Seiler, Wolfgang and Ulrich Schmidt

APPARATUS FOR DETERMINING SMALL AMOUNTS OF CARBON MONOXIDE OR HYDROGEN IN ATMOSPHERIC AIR. *(Max-Planck-Gesellschaft zur Foerderung der Wissenschaften e.V., Goettingen (Federal Republic of Germany)) U. S. Pat. 3,871,827. 5p., March 18, 1975. 5 refs. (Appl. April 25, 1973, 13 claims).*

Carbon monoxide and hydrogen are determined in atmospheric air by reaction with yellow mercuric oxide at elevated temperature and optical determination of the elementary mercury in the air stream behind the reaction chamber. Water vapor is removed by drying and other reactive gases are eliminated by molecular sieves having suitably dimensioned pores before contact with the mercuric oxide. Hydrogen in the presence of carbon monoxide is determined by first selectively oxidizing the carbon monoxide to carbon dioxide. The effect of hydrogen on the carbon monoxide measurements is compensated for by a zero setting established after removal of the carbon monoxide. The temperature of the mercuric oxide is selected to minimize or maximize reaction with hydrogen. (Author abstract)

60023 **APTIC NO. 84199**

Seim, B. and K. H. Zoerner

MODERN GAS ANALYZERS. *(Neuzeitliche Gasanalysengeraete). Text in German. Oel Gasfeuerung, 20(11):573-575, 1975.*

A survey of commercially available gas analyzers for the measurement of certain pollutants is presented. Volumetric and colorimetric methods to determine hydrogen sulfide and other toxic gases have been used for a long time. The Orsat instrument, manually or automatically operated, was the classical prototype for volumetric work. Sulfur dioxide, ammonia, and sulfhydryl can be determined in modified simple (Simplex) or multiple (Duplex or triplex) gas-volumenometers. The manual variety can be used to rapidly establish carbon dioxide content in smoke. Volumetric instruments are chiefly applied to furnaces to control economic combustion and to minimize environmental pollution. Colorimetric gas analyzing processes work by means of a strip of test paper with chemically selective color indicators, an optical scanner with lamp, radiation filters, and photoelectric cells. Determination is accomplished by comparing the proportional color contrast between two reaction fields on the test paper of which one is exposed to the gas to be measured. Colorimetric gas analyzers (Monocolor) of high sensitivity are used for the control of atmospheric pollutant concentrations and industrial waste gases in refineries, cellulose plants, garbage incinerators etc. A non-dispersive infrared mono-ray gas analyzer (Unor) is based on selective absorption of IR radiation by the molecules of the gas to be determined. The NDIR gas analyzer is used for the determination of carbon monoxide, carbon dioxide, methane, acetylene, ethylene, SO2, nitric oxide, NH3, and carbon disulfide, carbon tetrachloride and other high-molecular gases and vapors.

60024 **APTIC NO. 80117**

Sem, Gilmore J. and Kazo Tsurubayashi

A NEW MASS SENSOR FOR RESPIRABLE DUST MEASUREMENT. *Am. Ind. Hyg. Assoc. J., 36(11):791-800, Nov. 1975. 10 refs.*

A new portable mass sensor for respirable dust measurementt is described which uses an electrostatic precipitator. The instrument is intended for accurate 2-minute measurements of aerosol particles smaller than 10 micron in the 100 microgram/cu m range. The piezoelectric sensor is sensitive to the actual mass of the aerosol particles, whether they are solid, liquid, or a mixture. Particle collection efficiency onto the sensor by an electrostatic precipitator is greater than 95% for most aerosol sizes and compositions tested. An impactor with 8 micron unit density cutoff diameter provides the upper particle size limit while particles as small as 0.1 micron are collected and sensed with high efficiency. (Author conclusions modified)

60025 **APTIC NO. 80024**

Seno, K., T. Watanabe, and M. Imagawa

COMPARATIVE STUDIES OF NOX MEASURING DEVICE FOR EXHAUST GAS. *(Hai gasu-yo NOx keisokuki no hakaku kento). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(10):87-92, 1975.*

Eleven nitrogen oxides measuring devices based on the chemiluminescence, infrared absorption, ultraviolet absorption, and electrolytic methods were compared for their sensitivities and stabilities. The waste gas used for the study was from 110 ton/hr heavy oil boiler and contained 13% carbon dioxide, 10% moisture, 3% oxygen, 1100 ppm sulfur dioxide and 300-400 ppm nitrogen oxides. The meters were subjected to a continuous operation for one month before the tests. The NOx meter of A company employing the chemiluminescence method showed a span drift of minus 60 ppm, approximately 1/7 of the total NOx concentration. Four meters employing the chemiluminescence method, one meter employing the electrolytic method, and one meter employing the UV absorption method showed stable span drift. The meter of F company employing the chemiluminescence method and the meter of G company employing the IR absorption method showed high sensitivity. Results of measurements on incinerator waste gases containing 96 ppm, 206 ppm, and 467 ppm, NOx revealed that the higher the NOx concentration was, the greater was the standard deviation for all the meters.

60026 **APTIC NO. 84178**

Seno, Kiichi, Takashige Watanabe, Sadao Asakawa, Masahiro Imagawa, Shigeru Ota, and Atsushi Kondo

COMPARISON OF NOX ANALYZERS FOR FLUE GAS, PART 2. *(Endo yo NOx keisokuki no hikaku kento, 2, toshi gomi shokyakuro no haigasu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):297, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 38.)*

A comparison of different auto-analyzers for nitrogen oxides measurement is described. Seven different analyzers manufactured by 7 companies were used. The principles of the analysis were: 4 by chemiluminescence, 2 by non-dispersive infrared absorption, and 1 by ultraviolet absorption. All 7 analyzers continuously measured the NOx level in a chimney duct of an urban refuse incineration furnace for 26 days. The NOx level in the duct was around 150 ppm by a manual analysis. The stability of the zero span was good for all analyzers except during the test period, although the zero span was adjusted by each maker every week. The determined NOx level was similar for all analyzers except one. However, the observed NOx level by the auto-analyzers tended to be 10% lower than that by the manual analysis.

60027 **APTIC NO. 84183**

Seno, Kiichi, Takashige Watanabe, Sadao Asakawa, Shigeru Ota, Atsushi Kondo, and Masahiro Imagawa

COMPARATIVE STUDIES ON NOX ANALYZERS IN STACK GAS, PART 1, ON THE BOILER EXHAUST GAS. *(Endo NOx keisokuki no hikaku kento, sono 1, boira haigasu ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):296, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 37.)*

Eleven analyzers for flue gas nitrogen oxides determination were compared by the measurement of flue gas NOx from a heavy oil combustion boiler. Of 11 analyzers, 5 used the chemiluminescence method, 2 used non-dispersive infrared absorption methods, 2 used the ultraviolet absorption method, and the rest used controlled potential electrolysis. The comparison made was for stability (zero and span drifts), sensitivity, accuracy, linearity, and converter efficiency. There was no general trend of analyzer efficiency by the different methods; the analyzer characteristics varied by the make. The accuracy of 6 analyzers was within 0.6%, and the rest of the analyzers were more than 10%. The linearity was good for 8 analyzers, however the converter efficiency was poor for all analyzers.

60028 **APTIC NO. 84293**

Shabad, L. M., A. J. Chesina, G. A. Smirnow, N. E. Stepina, E. Huenigen, W. Prietsch, N. Jaskullas, and M. Naumann

THE DETERMINATION OF THE CARCINOGENIC HYDROCARBON BENZ(A)PYRENE CONTAINED IN THE EXHAUST GASES OF CARS WITH OTTO ENGINES. *(Die Bestimmung des kanzerogenen Kohlenwasserstoffs Benz(a)pyren in den Abgasen von PKW mit Otto-Motoren). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete, 21(12):869-873, Dec. 1975. 13 refs.*

A testing method for determining the emission of benzo(3-4)pyrene from automobiles with Otto engines is described. Sampling, extraction, chromatographic fractionation, and qualitative and quantitative determination of benzo(2-3)pyrene by means of quasilinear fluorescence spectrometry using polycrystalline solutions frozen in n-paraffin at 77 K are described. Measurements carried out on 4 kinds of vehicle are presented.

60029 **APTIC NO. 80889**

Shaw, Manny and Michael D. Shaw

MEMBRANE POLAROGRAPHIC SENSORS IN AIR POLLUTION ANALYSIS. *Preprint, Interscan Corp., Chatsworth, Calif., and International BioPhysics Corp., Irvine, Calif., 9p., 1975.*

The operating principle of membrane type electrochemical sensors is described. These devices are accurately described as membrane type polarographic gas sensors (MPS). Common to all polarographic devices are a polarizable sensing electrode, a nonpolarizable counterelectrode, and a supporting electrolyte. A small portion of gas molecules diffuses through the membrane covering the sensing electrode from the gas sample flow across this membrane. Corresponding opposite electrochemical reactions occur at the sensing and reference electrodes. Diffusion of the reactant must be the limiting step in the sequential process for the MPS to act as a sensing device. The primary output of the MPS is electrical current, making it an amperometric device. The sensing electrode potential must be maintained in the range of the limiting diffusion current. This is different for different pollutants. Correlation factors of 0.995 and 0.996 show an effective 1 to 1 correlation with the Saltman method for nitrogen oxides and the Beckman NDIR Analyzer for vehicle emission tests. Membrane polarographic sensors for stack monitoring require adequate sample conditioning for the removal of particulates, lowering the temperature to ambient levels, and preventing the condensation of water within the MPS. Membrane polarographic sensors are being successfully used for air pollution monitoring. These analyzers have much lower initial and operating costs than other types of analyzers, and are adaptable to portable monitoring applications.

60030 **APTIC NO. 76630**

Shevchenko, A. M.

SPECTROPHOTOMETRIC DETERMINATION OF TOLUENE IN THE AIR IN THE PRESENCE OF METHACRYLIC ACID BUTYL ESTER. *(Spektro fotometricheskoe opredelenie toluola v vozdukhe v prisutstvii butilovogo efira metakrilovoy kisloty). Text in Russian. Gigiena i Sanit., no. 2:71-72, 1975. 2 refs.*

An improved ultraviolet spectrophotometric method for the determination of toluene in the air in the presence of butylmethacrylate is described. Air is sampled in n-heptane as an inert solvent at a rate of 15 l/hr. The Lambert-Beer law is obeyed in a concentration range of 1-15 microgram/ml, and the error does not exceed 4%. The sensitivity of the method amounts to 3 microgram/ml. Up to a concentration of 50 microgram/ml in the sample, butylmethacrylate does not interfere with the determination of toluene. The method is suitable for the analysis of toluene in tests of polybutylmethacrylate-base plastic materials.

60031 **APTIC NO. 84124**

Shigeta, Ayamichi, Akiko Endo, Arinori Matano, and Kunihiko Ishii

DETERMINATION AND SAMPLING METHOD OF ACETIC ACID AND PHTHALIC ACID IN EXHAUST GAS. *(Haigasuchu no sakusan oyobi futarusan no sanpuringu ho to bunsekiho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):321, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 63.)*

Acetic acid was sampled by two connecting gas collection bottles each containing 100 ml of distilled water with an aspiration velocity of 1 l/min, and was prepared for analysis by gas chromatography. The test material was concentrated by an evaporator; differences in analyzed values due to concentration of the test material were held at under 2.3%. Phthalic acid was sampled by a gas collection bottle containing 100 ml of acetone with an aspiration velocity of 1 l/min, and was prepared for analysis by gas chromatography. The following plots were made: collection rate and heating temperature, esterification rate and heating temperature, and esterification rate and volume of phthalic acid.

60032 **APTIC NO. 81676**

Shirayama, Hajime and Hideichi Okumura

ANALYTICAL METHOD OF POLYCYCLIC AROMATIC HYDROCARBON IN THE ENVIRONMENTAL ATMOSPHERE. *(Kankyo taikichu no takan hokozoku tankasuiso rui no bunsekiho). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 46, 1975. (Presented at the Japan Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

An analytical method for polycyclic aromatic hydrocarbons in the atmosphere was evaluated. Polycyclic aromatic HC samples were collected on a glass fiber filter using a high volume air sampler, extracted by vacuum sublimation, and either separated by double layer--two dimensional thin-layer chromatography and determined by fluorescent spectrometry, or separated and determined simultaneously using a combined system of high-speed liquid chromatography and fluorescent spectrometry. The recovery rate of the sample in the vacuum sublimation process measured using benzo(3-4)pyrene was about 90%, while that of benzo(3-4)pyrene in thin-layer chromatography was above 65%. The high speed liquid chromatogram of 19 standard substances is given with measurement results of benzo(3-4)pyrene in samples collected along Highway 8 (0.7 microgram/1000 cu m) and by a carbon electrode plant (190 microgram and 530 microgram/1000 cu m).

60033 **APTIC NO. 82120**

Shofner, Frederick M.

SYSTEM FOR COLLECTING PARTICULATES FROM A FLUID MEDIUM. *(Environmental Systems Corp., Knoxville, Tenn.) U. S. Pat. 3,914,979. 9p., Oct. 28, 1975. 3 refs. (Appl. July 16, 1973, 13 claims).*

A system for sampling airborne particulates suspended in a fluid medium is described. The system is applied to mineral laden droplets in the effluent from cooling towers of salt bearing particulates born inland by winds from the ocean. Known prior art devices for collecting airborne particulates by inertial impaction are dependent upon natural wind flow, either to create the particle velocity necessary to cause particulates to impinge upon the collector with sufficient velocity to stay on the collector, or to insure that the volume of air is not resampled. This system is independent of natural wind currents and has a high collection efficiency. The collector traces a helical path through the particulate containing fluid medium. It is moved at all times in a direction substantially normal to the direction of flow of the fluid medium. The collector is readily removed from the system for analysis purposes.

60034 **APTIC NO. 83231**

Sigal, I. Y., L. M. Tsirul nikov, S. S. Nizhnik, and V. G. Konyukhov

DETERMINATION OF NITROGEN OXIDES IN BOILER FLUE GASES. *(Opredelenie okislov azota v dymovykh gazakh kotlov). Text in Russian. Elektr. St. (Moscow), vol. 7:19-21, 1975. 4 refs.*

The photocolorimetric and linear coloristic methods of determining nitrogen oxide content are described and compared. A color selective reaction of chemical interaction between nitrogen oxides of flue gases and the indicator solution with the Griess reagent underlies the photocolorimetric method. The color selective chemical reaction is accomplished by the formation in the solution of colored complexes whose color absorption is determined photocolorimetrically. In contrast, the linear coloristic method is based upon the reaction between nitrogen dioxide and the indicator powder agent with the isolation of the product of the reaction, which has a different coloration than that of the indicator. The length of the changed color of the column of the indicator tube is proportional to the concentration of nitrogen dioxide. The first method is recommended for conducting basic and control industrial and laboratory investigations, while the second ensures accuracy of measurement when correction coefficients are introduced.

60035 **APTIC NO. 76318**

Smith, Terence N. and Colin R. Phillips

INERTIAL COLLECTION OF AEROSOL PARTICLES AT CIRCULAR APERTURE. *Environ. Sci. Technol., 9(6):564-568, June 1975. 6 refs.*

The flow of a real, viscous fluid to a circular aperture in a flat plate is computed using a relaxation method. This flow field and the trajectories of spherical particles through it are used to derive efficiencies of collection by the combined mechanisms of inertia and interception, of aerosol particles on the surface of a membrane filter of the Nuclepore type. Complete results for a filter porosity of 0.111 are given, and a generalization to smaller porosities is suggested. (Author abstract)

60036 **APTIC NO. 84499**

Smith, Walter

COLLECTION EFFICIENCY STUDY OF THE PROPOSED METHOD 13 SAMPLING TRAIN (FINAL REPORT). *Entropy Environmentalists, Inc., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1792, Program Element 1AA010, Rept. EPA-600/2-75-052, 28p., Sept. 1975.*

The collection efficiency of the proposed Method 13 sampling train and the accuracy and precision of the two Method 13 analytical techniques for determining fluorides were investigated. A collection efficiency of 99% for gaseous hydrogen fluoride was obtained for fluoride concentrations ranging from 6-118 ppm and at sampling rates of 3/4 and 1 cu ft/min. The fluoride specific ion electrode method of fluoride analysis was more accurate and precise than the Spadns Zirconium Lake colorimetric method, with the latter showing a positive bias. (Author abstract modified)

60037 **APTIC NO. 75993**

Smith, W. B., K. M. Cushing, G. E. Lacey, and J. D. McCain

PARTICULATE SIZING TECHNIQUES FOR CONTROL DEVICE EVALUATION. *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-0273, Program Element 1AB012, ROAP 21ADM-011, Rept. EPA-650/2-74-102-a, SORI-EAS-75-369, 133p., Aug. 1975. 12 refs.*

NTIS: PB 245184/AS

Laboratory and field evaluations of inertial sizing techniques (cyclones and cascade impactors) were performed in an effort to find a suitable method for the evaluation of pollution control devices. Laboratory tests with hard, dry aerosols indicated that approximately 10 m/sec is the practical upper limit for impactor jet velocities if reentrainment is to be avoided. Glass fiber substrate weight gains which were mostly due to sulfate uptake on the substrates constituted a severe problem. Preconditioning of normal Gelman type A substrates for several hours in flue gas reduced the weight gains considerably. Teflon, Whatman GF/A and GF/D, and Reeve Angel 934 AH were glass fiber materials which showed little weight gain. Electrostatic effects posed a substantial interference with bare collection plates, although the effect with glass fiber substrates was minimal. Design and calibration data were also obtained for two series of cyclone size devices: one designed to operate at a flowrate of 140 l/min and the other at 28 l/min. Each provided three size fractionation points in the 0.5-10 micron size interval. The cyclone systems permitted the collection of larger quantities of size fractionated particulates and were somewhat easier to use than were the impactors. (Author abstract modified)

60038 **APTIC NO. 83015**

Smith, Walter S. and D. James Grove

SYSTEMATIC ERRORS AND THE VALUE AND VALIDITY OF STACK TEST DATA. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 5p., 1975. (Presented at the Specialty Conference on Air Pollution Measurement as it Relates to Regulation Compliance, New Orleans, La., Oct. 27-28, 1975.)*

Stack sampling data, like any statistical data, are subject to the three basic types of errors: gross, random, and systematic. Gross errors are usually obvious; extremes and generally thrown out in the interpretation of data. However, tests have been performed where changing source conditions have caused one run to be much higher or lower than the rest, and this run is usually voided even though it could have been an accurate measurement. Averaging reduces the effect of random errors. Systematic errors ara those that affect each individual result of replicate tests in exactly the same way. One source of systematic errors in stack test data is the assumption that particulate sampling trains are 100% efficient. Probable efficiencies actually vary with different types of collectors. When a pitot tube is used, systematic error also arises from the assumption that all of the carrier gas and the particulate matter are traveling exactly perpendicular to the stack cross section. There is no means with any of the standard methods to detect and correct for other flow situations. Further systematic error results when the sampler uses velocity data affected by this systematic error to get isokinetic sampling rates for particulate sampling. Reproducibility or precision does not imply accuracy where there is the potential for a systematic error. The crucial factors are to take enough samples to reduce random errors, to study the process sampled and the results to identify gross errors, and to identify and quantify or remove the systematic errors.

60039 **APTIC NO. 80368**

Snider, Donald E.

REFRACTIVE EFFECTS IN REMOTE SENSING OF THE ATMOSPHERE WITH INFRARED TRANSMISSION SPECTROSCOPY. *J. Atmospheric Sci., 32(11):2178-2184, Nov. 1975. 26 refs.*

A ray tracing technique was used to study the effects of atmospheric refraction on the computed air mass and the single layer effective pressure for a grazing ray from the sun. Several representative occultation geometries were considered. Errors in the computed air mass and effective pressure, associated with neglecting refraction, are a function of observer altitude. Neglecting refraction of the air mass and effective pressure can lead to overestimates of these quantities by up to 25% for aircraft observers, 60% for high altitude balloons, and 200% for satellite observers. The errors introduced by neglecting refraction are probably less than those introduced by uncertainties in solar pointing for observers in high altitude aircraft. Refraction should definitely be taken into account when the minimum altitude of the grazing ray is less than 20 km for observers in high altitude balloons or satellites. Errors in minimum altitude are even more important for interpretation of infrared transmission spectra, where the absorption depends on pressure. Not only the air mass but also the effective pressure would be overestimated by neglecting refraction. As a result of overestimating these quantities, the mixing ratios for minor constituents in the lower stratosphere would tend to be underestimated. (Author abstract modified)

60040 **APTIC NO. 82119**

Snyder, Louis J.

DETERMINATION OF ANTIKNOCK COMPOUNDS IN GASOLINE. *(Ethyl Corp., Richmond, Va.) U. S. Pat, 3,912.454. 8p., Oct. 14, 1975. 3 refs. (Appl. June 24, 1974, 13 claims).*

A method for the determination of the concentration of lead as alkyl lead in liquids and/or gases which is capable of being run by non-technical personnel and which is highly sensitive and accurate is described. Methods for determining Pb concentrations in gasoline are important because of government guidelines requiring the manufacture and marketing of unleaded gasoline. The methods are useful in the pollution control area where alkyl lead concentration in aqueous plant effluent and in the atmosphere are to be monitored. The fluid containing Pb is contacted with iodine monochloride to yield lead dialkyl dihalide. The resulting solution is treated with a buffering and masking solution and contacted with a solution of an inert colorless dithizone solvent. The concentration of Pb as alkyl lead present in the fluid is determined by measuring the color intensity or by comparing the color of the solvent phase with standardized colors. (Author abstract modified)

60041 **APTIC NO. 82200**

Sofuku, Masataka, Atsuko Kobayashi, Hisashi Yokota, Kinji Nakano, and Toshio Ohira

ANALYTICAL METHOD OF PBZN. *(PBzN no bunsekiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):308, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 50.)*

Analysis of peroxybenzyl nitrate by gas chromatography with an electron capture detector was studied with laboratorary synthesized peroxybenzyl nitrate which was dissolved in n-hexane as the standard sample for GC injection. The GC conditions used were a 0.5% OV-17GCQ (80/100) column, nitrogen carrier gas at a flow rate of 210 ml/min, and a column temperature of 50 C. With these conditions, the retention time of the peroxybenzyl nitrate was about 1 min and it could be separated from n-hexane. The stability of peroxybenzyl nitrate in n-hexane was also studied. A full 100% peroxybenzyl nitrate could be retained in n-hexane for 5 hr at 4 C; however, the stability rapidly decreased with increased solution temperature to 25 C. Therefore, the use of cold n-hexane was necessary to trap gaseous peroxybenzyl nitrate. The detection limit by this method was about 0.5 ppb peroxybenzyl nitrate.

60042 **APTIC NO. 84632**

Souda, Toshifumi and Satoshi Furukawa

DETERMINATION OF LOWER ALIPHATIC ACIDS CAUSING MALODOR. *(Akushu to shite no teikyu shibosan no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):317, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 59.)*

The results of a quantitative analysis of airborne fatty acids in the neighborhood of drainage treatment tanks of an acid manufacturing plant are given. Gas chromatography with flame ionization detector (FID-GC), and standard test materials of lower aliphatic acids using mass fragment method (MF) with gas chromatography-mass spectrometry (GC-MS) were employed. Fillers for the GC column were chromosorb 101, FAL-M, and PEG 6000, of which FAL-M was the best; PEG 6000 was used as a filler for the MF column. N-valerianic acid, n-butyric acid, and propionic acid (listed in order of measured magnitude) were found in the airborne lower aliphatic acid which caused malodor in the area of the drainage treatment tank. The result of the test confirms that highly sensitive quantitative analysis of airborne lower aliphatic acid is possible and that the GC-MS-MF method is more sensitive than the FID-GC method.

60043 **APTIC NO. 81882**

Sperling, R. B.

EVALUATION OF THE CORRELATION SPECTROMETER AS AN AREA SO2 MONITOR (FINAL REPORT). *Environmental Measurements, Inc., San Francisco, Calif., Environmental Protection Agency Contract 68-02-1773, Program Element 1AA010, Rept. EPA-600/2-75-077, 115p., Oct. 1975.*

A field evaluation of the Barringer Correlation Spectrometer (COSPEC) was performed at a pulverized coal-fired power plant. The COSPEC is a remote sensing system designed to measure sulfur dioxide and/or nitrogen dioxide by absorption phenomena using scattered sunlight as an energy source. Measurements we made via upward viewing from a moving laboratory that was driven under the plume in an effort to determine the relative accuracy of the COSPEC as a perimeter monitor for SO2 emissions. Concurrent in-stack emissions measurements were made along with winds aloft measurements using a balloon theodolite. The COSPEC measured SO2 emissions with a relative accuracy of + or - 24% when used with a single balloon theodolite to measure winds. A total of 11 20-minute samples of COSPEC remote sensing (4 hr of plume measurements) were required to achieve a + or - 25% error with 95% confidence. Increased frequency and accuracy of winds aloft measurements are expected to improve the accuracy of the COSPEC system. (Author conclusions modified)

60044 **APTIC NO. 81149**

Spurny, Kvetoslav, Christoph Boose, and Dieter Hochrainer

ATOMIZATION OF ASBESTOS FIBERS IN A FLUIDIZED BED AEROSOL GENERATOR. *(Zur Zerstaeubung von Asbestfasern in einem Fliessbett-Aerosolgenerator). Text in German. Staub, Reinhaltung Luft, 35(12):440-445, Dec. 1975. 20 refs.*

Fluidized bed aerosol generators that have been used to produce spherical particles from powders were used to prepare aerosols from different types of asbestos particles. One-component beds and two-component beds were used and compared. Fluidized beds with mechanical vibration were also used. These methods permitted the preparation of usable aerosols with constant concentrations. The concentration as well as the fiber size distributions could be varied as a function of the physical properties of the fluidized bed.

60045 **APTIC NO. 80286**

Spurny, Kvetoslav R. and Werner Stoeber

FILTRATION, SAMPLING AND ANALYSIS OF ASBESTOS AEROSOL IN AMBIENT AIR. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 443-454. 16 refs. (Feb. 17-21.)*

The efficiency of Nuclepore filters versus membrane filters for the collection of airborne asbestos was evaluated. Asbestos fibers sampled by Nuclepore filters in urban and non-urban locations were readily distinguishable from the background of the filter surface and from non-fibrous particulates, thus permitting the measurement of single fibers and the plotting of size distribution curves of atmospheric asbestos aerosol. Higher fiber concentrations were obtained with Nucleopore filters than with membrane filters. Since Nuclepore filters have no inside structure and since the pores are approximately monodisperse, there are practically no losses of fibers and fibrils inside the pores.

60046 **APTIC NO. 82699**

Stafford, Richard G. and Richard K. Chang

ABSOLUTE RAMAN SCATTERING CROSS SECTIONS OF SULFATE AND BISULFATE AND THEIR APPLICATION TO AQUEOUS AEROSOL MONITORING. *Preprint, Yale Univ., New Haven, Conn., Dept. of Engineering and Applied Science, 4p., 1975. 33 refs. (Presented at the Environmental Sensing and Assessment Conference, Sept. 14-19, 1975.)*

The feasibility of measuring the concentration of sulfate, bisulfate, and sulfuric acid in aqueous aerosols by the Raman scattering technique was demonstrated. Absolute Raman scattering cross sections of bisulfate and sulfate were measured in solution, and the cross sections of these anions were independent of the cation when the molecules were strongly dissociated. Measurements were performed on solutions of sulfuric acid, ammonium sulfate, ammonium bisulfate, and alkaline sulfates and bisulfates. Linearity of the Raman scattering intensity as a function of molarity was determined over pollutant concentrations most likely to occur in aqueous aerosols, and the above compounds were detectable in the small ppb range with at least 10% accuracy for sampling times of less than 1 hr. (Author abstract modified)

60047 **APTIC NO. 82728**

Stedman, D. H.

CRITERIA FOR THE OBJECTIVE EVALUATION OF NO/NO2/O3 AIR MONITORING DATA. *Preprint, Michigan Univ., Ann Arbor, Dept. of Chemistry, 12p., 1975. 14 refs. (Presented at the ICES A Proceedings, Las Vegas, Nev., Sept. 1975.)*

Errors which can invalidate nitric oxide/nitrogen dioxide/ozone air monitoring data are reviewed along with criteria for establishing a continuous calibration system. Inlet system residence time, if greater than about 2 sec, can cause low NO/O3 and high NO2 readings. Finite NOx/NO subtractive circuit switching times cause appreciable random errors in NO2 readings. Long averaging times or slow response instruments lead to erroneously high apparently simultaneous values of NO and O3. Calibration errors are also a continuous problem. The reactions of NO2 with ultraviolet light, atomic oxygen with molecular oxygen, NO with O3, and NO2 with O3 are used together with air monitoring data to numerically evaluate each of the above errors and to set rigorous upper bounds on the ratio of (NO) (O3)/(NO2) based on latitude and time of day. These ractions and monitoring data also are used to form the basis of a continuous calibration system. (Author summary modified)

60048 **APTIC NO. 83008**

Stedman, D. H., G. Kok, R. Delumyea, and H. H. Alvord

REDUNDANT CALIBRATION OF AIR POLLUTION MONITORS BY CHEMICAL AND GRAVIMETRIC TECHNIQUES. *Preprint, ASTM Committee D-22, Philadelphia, Pa., 15p., 1975. 12 refs. (Presented at the Calibration Problems and Techniques Symposium, Boulder, Colo., Aug. 5-7, 1975.)*

Sources of nitric oxide and carbon monoxide have been developed for calibrating air pollution monitors. Calibrated NO sources are described using ammonia and nitromethane permeation followed by pyrolysis. These can be absolute standards. They can also be intercalibrations if an NH3 or CH3N02 detector should be available. A field CO calibrator based on nickel carbonyl as the liquid fill is discussed. Nickel carbonyl proved to be a stable but nonquantitative CO source with no Ni(CO)4 impurity. This may be a useful transfer standard but is not an absolute calibrator. Two techniques for intercalibrating chemiluminescent NO and ozone meters using the photolysis of nitrogen dioxide are demonstrated, together with the feasibility of a continuous check on NO, NO2, and 03 meters in ambient air, based on a photostationary state measurement. (Author abstract modified)

60049 **APTIC NO. 80306**

Steinfeld, Jeffrey I.

TUNABLE LASERS AND THEIR APPLICATION IN ANALYTICAL CHEMISTRY. *Crit. Rev. Anal. Chem., 5(3):225-241, 1975. 71 refs.*

The impact that laser techniques might have in chemical analysis is considered. Three types of experimental methods are considered: absorption, scattering, and heterodyne detection. Ultimate sensitivity is discussed for two particular cases: direct absorption spectroscopy and nonlinear spectroscopy. Tunable devices that are now available include solid state lasers and frequency converters in the infrared portion of the spectrum, and organic dye solution lasers in the visible. The most important clases of solid state infrared devices are discussed. The tuning range of a laser can be considerably extended by the use of optical mixing. Types of dyes, pumping methods, frequency narrowing methods, and operating parameters for organic dye solution lasers are also discussed. The first use of any laser device in analytical chemistry was in microprobe analysis. Long path absorption monitoring and backscatter techniques are discussed. The instrumental methods described include laser Raman spectroscopy, atomic absorption/fluorescene spectrometry, fluorescence assay techniques, optoacoustic spectroscopy, and optical rotary dispersion and circular dichroism.

60050 **APTIC NO. 82837**

Stephens, James B., Parameswar Mahadevan, and Raymond L. Chuan

METHOD AND APPARATUS FOR THE DETECTION OF NITRIC OXIDE. *(California Inst. of Tech., Pasadena) U. S. Pat. 3,881,111. 7p., April 29, 1975. 7 refs. (Appl. Sept. 27, 1973, 26 claims).*

A method and apparatus for detecting the presence and quantity of nitric oxide are desccribed. A volume of gas is illuminated by a source of ultraviolet radiation to produce ionization of any NO present. The resulting NO ions are detected by an ion detection system. The source of ultraviolet radiation is either a window or windowless device. Unlike other devices, this device can be readily deployed and maintained in close proximity to a combustion system such as a smokestack, exhaust pipe, or in the field for ambient air monitoring. (Author abstract modified)

60051 **APTIC NO. 81838**

Sticksel, Philip R.

NEW DIRECTIONS IN OPACITY MEASUREMENTS. *Preprint, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 16p., 1975. 3 refs. (Presented at the Energy and the Environment National Conference, 3rd, Oxford, Ohio, Sept. 30, 1975.)*

Future trends in opacity measurements are discussed in light of the inclusion of visible emission standards in New Source Performance Standards. In-stack monitors are expected to replace many of the functions formerly performed by human observers. Under the New Source Performance Standards several of the industrial source types are now required to install opacity monitoring instruments in stacks for their new equipment. Human observers are expected to perform additional duties which include the following: regular observations of all visible emission sources to check on compliance with opacity standards or to verify proper operation of in-stack monitors, the acquisition of data for different meteorological conditions and variations in raw materials and operation conditions, observations of fugitive dust emissions that cannot be made by in-stack devices, and the monitoring of visible emissions from an increasing number of coal combustion sources to ensure sufficient fuel usage.

60052 **APTIC NO. 82698**

Strup, P. E., P. W. Jones, R. D. Giammar, and T. B. Stanford

EFFICIENT COLLECTION AND ANALYSIS OF HAZARDOUS ORGANIC COMPOUNDS FROM COMBUSTION EFFLUENTS. *Preprint, Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., 4p, 1975. 12 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

A method for the collection and analysis of combustion effluents using a polymeric chromatographic adsorbent is described. The collected species are initially separated into chemical classes via liquid chromatography using a modified Rosen type separation. Preliminary screening of the chemical classes is performed by infrared spectrometry, while analysis and quantification of the collected species are performed by gas chromatography-mass spectrometry. The method is two and half to 10 times more efficient than the Environmental Protection Agency Method 5 technique in collecting polycyclic compounds and, unlike Method 5, is not adversely affected by sulfur oxides. Laboratory validation experiments and field tests of the method indicate that it is also capable of identifying such compounds as aliphatic alkenes and alkanes, aromatic hydrocarbons, ethers, aldehydes, esters, ketones, alcohols, acids, and carbozoles.

60053 **APTIC NO. 79522**

Subbotin, A. I., V. I. Trachenko, and L. N. Yankitova

RECOVERY OF N,N-DIMETHYLFORMAMIDE AND ETHYLACETATE VAPORS. *(Rekuperatsiya N,N-dimetilformamida i etilatsetata). Text in Russian. Plast. Massy, no. 5:20-22, 1975. 5 refs.*

The adsorptive recovery of N,N-dimethylformamide and ethylacetate, emitted into the air during the processing of plastic materials, was studied. The organic vapor concentrations in the air ranged from 0.01 to 50 mg/l. The vapors were adsorbed on AR-3 type activated carbon at 30 C. Desorption was done with water vapor at 105 C. The rates of hydrolysis occurring during desorption amounted to 0.2% for ethylacetate, and to less than 0.05% for N,N-dimethylformamide. The two solvents were separated from the desorbate by distillation.

60054 **APTIC NO. 79990**

Sudo, K. and T. Goto

DETERMINATION METHOD OF ENVIRONMENTAL ODOR BY SHELTER METHOD. *(Sheruta ho ni yoru kankyo shuki no sokuteiho). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 3:31, 1975.*

A measurement method for trimethylamine using a filter paper absorption-gas chromatography technique is described. A filter paper (11 by 13 cm) was dipped in saturated oxalic acid for 5 min, dried at 60 C, and wrapped on a porous pot cylinder. This was placed in a metal shelter, which was exposed in the air for 1 mo. The exposed filter paper was then treated with a 40% potassium hydroxide solution to liberate the absorbed trimethylamine. By using a nitrogen gas carrier, the liberated trimethylamine was concentrated in a GC column cooled by liquid oxygen. Upon the heating of the GC column at 100 C, trimethylamine was determined by GC with flame ionization detector. The filter paper impregnated with oxalic acid could also absorb ammonia gas. The exposed filter paper was treated by water to extract the absorbed ammonia, and the extracted ammonia was determined by colorimetry using Indophenol Blue. The technique was applied to measure both trimethylamine and ammonia in the atmosphere around a chemical plant. The absorbed trimethylamine in each 100 sq cm of filter paper for 1 mo ranged from 54 to 3500 ng, while the absorbed ammonia for 1 mo ranged from 15 to 220 microgram/100 sq cm of filter paper. The technique can provide data on trimethylamine and ammonia in terms of accumulated amounts for a desired period.

60055 **APTIC NO. 82443**

Suzuki, Ryota, Tadakatsu Nakaya, Masayuki Ito, and Haruo Oda

HYDROCARBON IN ATMOSPHERE AND SOURCES. *(Hasseigen oyobi Kankyochu no tankasuiso). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):311, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 53.)*

The analytical method for ppb level toluene was studied. The direct toluene concentration measured by the TENAX column at room temperature was not suitable when a large amount of air sample was to be concentrated, because of the large pressure loss. However, TENAX was feasible to concentrate a less than 1 liter gas sample. For the concentration of large amounts of gas sample, preconcentration using an activated carbon column was used, and the absorbed toluene was then reabsorbed to the TENAX column following the liberation of toluene from the carbon column at 150 C by injecting 200 microliter water to the carbon column. Upon heating the TENAX column at 200 C, the toluene analysis could be done by gas chromatography with flame ionization detector, and 100% toluene could be recovered. The method was applied to analyze toluene in film, cellophane tape, and rubber manufacturing factories, and in automobile exhaust gas, in which sample gas was collected initially with 5 liter Tedlar bags. The toluene discharge from the cellophane tape manufacturers ranged from 0.01 to 0.2 ton/day, and that from the film manufacturer was 3.1 ton/day. No toluene discharge was observed from the film rubber manufacturer which used its waste toluene as the fuel for a boiler and thus employed combustion treatment.

60056 **APTIC NO. 83103**

Szakasits, Julius J. and Alfred E. Krc

METHOD AND APPARATUS FOR TOTAL ANALYSIS OF HYDROCARBON SAMPLES. *(Shell Oil Co., Houston, Tex.) U. S. Pat. 3,880,587. 7p., April 29, 1975. 4 refs. (Appl. April 1, 1974, 7 claims).*

An apparatus and method for analyzing hydrocarbon samples utilizing a gas liquid chromatographic column in combination with an oxidizing furnace and two detectors are described. The column is heated at a programmed rate to analyze the volatile components of the sample plus the sulfur content of the volatiles. The carbon and S content of the non-volatile components are obtained by oxidizing them in the injection port and passing the oxidation products to the detectors. The use of an oxidizing furnace eliminates the necessity of regenerating the furnace as is the case when copper oxide furnaces are used. (Author abstract modified)

60057 **APTIC NO. 76399**

Szucsne Dely, Irma, Jozef Szava, and Lorant Balazs

EXPRESS METHOD OF DETERMINING THE SULFATE SULFUR CONTENT IN COALS. *(Szenek szulfatken-tartalmanak gyors meghatarozasa). Text in Hungarian. Banyasz. Kohasz. Lapok, Banyaszat, 108(1-2):98-101, Jan.-Feb. 1975. 14 refs.*

A new rapid oscillometric titration method for the determination of sulfate sulfur in coals is described. After the extraction of the sulfate sulfur from coal with hydrochloric acid, iron and other metals which are likely to cause interference are eliminated by evaporation. The filtrate is acidulated with diluted acetic acid; solid particulate barium sulfate and ethanol are added, and titration is done by means of 0.1N barium acetate under intense stirring by means of a high-frequency titrimeter or oscillometric titration. The relative error amounts to + or - 2%. Compared with the conventional gravimetric method, the time requirement is reduced to one third, and the lower limit of the quantitative determination is lowered by the oscillometric titration method.

60058 **APTIC NO. 83838**

Tagami, Shiro and Shuzo Nakamura

QUICK ANALYSIS OF TRACE HEAVY METALSS IN SUSPENDED PARTICULATES BY X-RAY FLUORESCENCE SPECTROMETRY. *(Keiko X-sen bunsekiho ni yoru fuyufunjin chu biryo jukinzoku no jinsoku bunseki). Text in Japanese. Preprint, Japan Society of Public Health, Tokyo, p. 378, 1975. (Presented at the Japan Society of Public Health, Lecture Meeting, 34th, Yokohama, Oct. 1975.)*

X-ray fluorescence spectrometry (simultaneous multi-element analysis) was evaluated as a quick analysis method for trace heavy metals in suspended particulates. Samples collected on glass fiber filter by Toyo Roshi Co. were determined using X-ray fluorescence spectrometer Model AFV-202F by Toshiba Co. Calibration curves were prepared using DDTC chelates of manganese, iron, zinc, lead, copper, and cadmium as standards, which showed good linearity. Measurement results of samples collected in Ohmuda city were compared with those determined by atomic absorption method, which were in fairly good agreement though some scattering in values was observed.

60059 **APTIC NO. 84302**

Tajiri, A.

AEROSOL WEIGHT CONCENTRATION MEASURING METHOD. (2). *(Earozoru no juryo nodo sokutei ho). Text in Japanese. Saiko to Hoan (Mining and Safety), 21(7):411-422, July 1975. 54 refs.*

The Hexhlet dust meter samples dust with cylindrical filter papers using a negative pressure ejector. Filter paper 41 by 123 mm in size are used at a negative pressure of 100 mm Hg. The meter is usable in the presence of combustible gas in air and it is widely employed for continuous measurement in underground mines. The Shibata-sedimenter is an improved low-volume sampler of the Hexhlet meter. The sedimenter uses a disc filter paper 45 mm in diameter and samples dusts at 20 l/min. The NCB/MER dust sampler has an 8-layer or 4-layer horizontal elutriator followed by a glass fiber filter. It samples at 2.5 l/min with a diaphragm pump and is capable of 8-10 hr continuous operation. The collection efficiency for particles larger than 5 micron is 100% for the 8-layer model. The amount of inflammable substance in the dusts can be measured by treating the fiber glass filter at 550 C. It can also be used as a sample for X-ray diffraction study. The MSA personal sampler is designed to collect 100% of the particles larger than 2 micron, using a cyclone and a vortex flow filter. The sampler is applicable for sampling radioactive dusts and is capable of continuous sampling for 10 hr. A large-scale electrostatic precipitator for field sampling collects the large particles and the small particles separately. The large particles are collected by a cyclone or elutriator. The collecting efficiency of particles larger than 0.5 micron is more than 99%.

60060 **APTIC NO. 82525**

Takagi, S.

STANDARD FOR ODOR DETERMINATION: ON THE T AND T OLFACTOMETER. *(Shukaku sokuteiyo kijunshu: T and T shiki orufakutometa ni tsuite). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 4(20):60-62, May 1975. 2 refs.*

An olfactometer developed with the cooperation of otorhinolaryngological physicians at various hospitals is described. The method was developed in order to establish a standard technique for clinical uses to determine a person s scent ability. The method uses 5 different compounds; beta-phenyl ethyl alcohol, methyl cyclopentenolone, iso-valeric acid, gamma-undecalactone, and scatol, each diluted into 8 different concentrations and bottled. Based on past experimental results for people aged 18 to 25, the concentration of the normal scent level was established, which is the third highest concentration for each compound. For a closer examination, five additional compounds were used: cyclopentadecanolide, phenol, dl-camphor, diallyl sulfide, and acetic acid. In the scent test for patients, the patients smells the scent paper dipped in each solution, and expresses his impression of each smelling according to six grades of odor intensity, which are expressed as common terms naming fruits, vegetables, and other familiar scents in order to avoid individual differences of expression by patients.

60061 **APTIC NO. 84180**

Takahashi, Hideo, Terukiyo Uto, and Haruhiko Komatsu

FRACTIONAL DETERMINATION OF SO2 AND SO2 IN COMBUSTION WASTE GASES. *(Nensho haigasuchu no SO2, SO3 bunbetsu teiryo). Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):300, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 42.)*

The feasibility of fractional analyses of sulfur dioxide and sulfur trioxide from the same absorption solution was studied. The absorption solution for SO2 and SO3 was the mixed solution of hydrogen peroxide and ammonium sulfamate. SO2 could be determined as the consumed amount of hydrogen peroxide during the gas absorption, and this was done by titrating the absorption solution with potassium permanganate solution. The neutralization titration of the absorption solution with sodium hydroxide solution gave the amount of SO2 plus SO3. Therefore, SO3 determination was possible from these two titrations. Nitrogen dioxide gave the increased SO2 value, since NO2 consumed hydrogen peroxide, however the NO2 interference could be minimized by increasing the concentration of ammonium sulfamate in the absorption solution. A standard gas with 1849 ppm SO2 was absorbed by the absorption solution which was then titrated by the above two methods. The SO2 value obtained by the potassium permanganate titration ranged from 1825 to 1849 ppm, while the value obtained by the sodium hydroxide titration ranged from 1844 to 1860 ppm.

60062 **APTIC NO. 82432**

Takahashi, Kanji

ATMOSPHERIC AEROSOL CHARACTERISTICS---VARIATION OF SIZE DISTRIBUTION IN PARTICULATE. *(Taiki earozoru no seijo---Tokuni ryudo bunpu henka ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 18-22, 1975. (Presented at the Japan Chemical Society Powder Symposium, 13th, Nov. 19-21, 1975.)*

The mathematical derivation of equations for particle number concentrations of aerosols as functions of place, time, molar number of component, and particle volume are given. The size distribution equations by Junge s exponential distribution are discussed. The size distributions of sea spray, motor vehicle emissions and desert background by two mode distribution and general size distribution are discussed. The mathematical derivation for variation in particle size distribution with time and for equilibrium particle size distributions are given. Experimental results concerning the variation of particle size distribution are also given. The characterization of aerosols in the atmosphere, variations in particle size distribution, and variations of chemical composition are also discussed.

60063 **APTIC NO. 80459**

Takahashi, Takeshi and Akira Kanagawa

EFFECT OF AN EXTERNAL ELECTRIC FIELD ON THE FILTRATION OF AEROSOLS BY FIBROUS FILTERS. *(Seniso firuta ni yoru earozoru no roka ni okeru gaibu denba no eikyo). Text in Japanese. Kagaku Kogaku Ronbunshu (Chem. Eng. Essay), 1(6):644-649, Nov. 1975. 10 refs.*

The single-fiber collection efficiency of fibrous filters with external electric fields was determined from calculations of the particle trajectory. Calculated results were smaller than experimental results, obtained by using aerosol particles of polystyrene-latex (PSL) (diameter 0.481, 0.81 micron) and DOP (diamter 0.85 micron), from which the electric charge had been removed. Glass fibers (diameter 22.1 micron), were aligned perpendicular to the flow of particles, and sandwiched (thickness 2 cm) between 16 mesh brass screening, which acted as electrodes. Voltage in the range of 1-14 kV was applied; average particle flow rate through the fiber layers, parallel to the direction of the electric field, ranged from 4.33-21.7 cm/sec. Collection efficiency increased with increase in fiber volume fraction and the specific dielectric constant of the fiber. A parameter showing the effect of an electric field, and the mobility of particles and their mean flow velocity on collection efficient was developed. When this parameter is large, the effect of fiber volume reaction is large; when the parameter is small, the effect of a specific dielectric constant of the fiber is large. Collection efficiency due to the simultaneous action of interception and electrical force is smaller than the sum of the collection efficiencies, calculated separately from the respective effects. Collection efficiency can be obtained analytically by the concept of solenoidal force field on particles, when the specific dielectric constant of the fiber is equal to unity. A formula for collection efficiency was developed for this situation, when the limit of the interfence parameter was less than 1.

60064 **APTIC NO. 82806**

Takeda, Kaihei, Taizo Nakano, Kazuyoshi Kaijo, and Toshiaki Okamoto

PARAMETER INPUT SYSTEM FOR POLLUTION SOURCE SYSTEMS. *(Hasseigen shisutemu no hensu nyuryoku shisutemu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):565, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 295.)*

A parameter input system is an off-line monitoring system for pollution sources. Parameters consist of pollution data changes; variations in calculations; output information from pollution sources; and other parameters, such as administrative blocks and analyses of effectiveness. Corrective check modes are programmed into the system. This system is in current use at the Osaka City Environmental Pollution Monitoring Center.

60065 **APTIC NO. 82321**

Takeyama, Kenichi, Takayoshi Morimoto, and Fumiya Konishi

BURNING AND COLLECTION APPARATUS FOR COMBUSTION GASES. *(Matsushita Electric Industrial Co., Ltd., Kadoma (Japan)) U. S. Pat. 3,904,368. 7p., Sept. 9, 1975. 6 refs. (Appl. March 5, 1973, 4 claims).*

A burning and collection apparatus for combustion gases is described. It includes a combustion unit having a combustion chamber in which a sample material is burned; an electric heating furnace; a gas supply unit for introducing air or gas at an optionally adjusted predetermined rate; a piston cylinder type gas collection unit for collecting the combustion gases generated in the combustion chamber; and a driving unit for operating the piston at an optionally adjusted predetermined speed. A sample material such as plastics is burned under an optional temperature and an optional air supply rate. The resulting combustion gases are collected without substantially diluting them, allowing the composition of the combustion gases to be analyzed with high accuracy. No other burning and collecting device has these advantages. (Author abstract modified)

60066 **APTIC NO. 82318**

Takinaga, Susumu

DETERMINATION OF THE AIR POLLUTION. *(Taiki osen no keisoku). Text in Japanese. Tetsudo Gijutsu Kenkyu Shiryo (J. Railway Eng. Res.), 32(10):392-397, Oct. 1975.*

Basic factors of instrumental measurement of air pollution are discussed in general terms. The purpose and significance of air pollution measurement are the characteristics of pollutants and bases for the selection of measurement instruments are discussed. Basic concepts of measurement systems, and specifications of measurement instruments relevant to selecting appropriate units are described. Basic matters concerning measurement methods, measurement equipment, measurement range, instantaneous value and mean value, sampling, accuracy, sensitivity, reproducibility, response time, stability, interference, and calibration curve are discussed. The selection of sampling devices, properties of samples, concentration ranges, coexisting components, sampling locations, the structure of sampling devices, and problems involved in sampling are discussed.

60067 **APTIC NO. 84465**

Talmi, Yair and Cyrus Feldman

THE DETERMINATION OF TRACES OF ARSENIC: A REVIEW. *Am. Chem. Soc. Symp. Ser., no. 7:13-34, 1975. 167 refs.*

Methods for the determination of traces of arsenic are reviewed. The methods include: molecular absorption spectrophotometry; radioachemical techniques such as neutron activation analysis and substoichiometric isotope dilution; electrochemical techniques such as amperometric titration, polarography, and coulometry; X-ray fluorescence spectroscopy; atomic spectroscopy such as atomic emission spectrometry and atomic absorption spectrometry; chromatographic methods such as total arsenic and speciation organo arsenic.

60068 **APTIC NO. 82807**

Tamori, Yukio, Nobuyuki Kogure, and Kazushige Imagami

EFFECTS OF SULFURIC ACID MIST IN DUST CONCENTRATION MEASUREMENT. *(Dasuto nodo sokutei ni okeru ryusan misuto no eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):330, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 73.)*

Dust concentration measurements of flue gas following wet desulfurization (process JIS Z 8808) may be inaccurate if the sulfuric acid mist collected with dust is measured as part of the dust. For the purpose of distinguishing solid dust and liquid H2SO4, vaporization characteristics of H2SO4 were investigated. On cylindrical filter No. 86R (borosilicate glass fiber) and No. 88 RH (silica glass fiber), two drops of 98% or 70% H2SO4 were placed, left standing in atmosphere or sealed in a weighing bottle for three days, weighed, dried at 110, 150, 200, 250, 300, 350 and 400 C for one hr, cooled and weighed again. At a drying temperature above 150 C, the residual H2SO4 on the filter gas was determined by the amount of H2SO4 and not by H2SO4 concentration. The H2SO4 on the filter was vaporized at 150-200 C, and the amount of residual H2SO4 was reduced markedly at temperatures above 200 C. The amount of residual H2SO4 on No. 88 RH was reduced to 20-32% at 200 C and 16-26% at 250 C. If the H2SO4 content in the sample is assumed to be 10 mg, the amount of residual H2SO4 is 3.4-2.6 mg, which is not a negligible amount in relation to the amount of solid dust.

60069 **APTIC NO. 82808**

Tamori, Yukio, Nobuyuki Kogur, and Kazushige Imagami

PROPOSAL FOR THE USE OF PLEATED ROUND FILTER IN DUST SAMPLING. *(Dasuto nodo sokutei ni okeru hidatsuki enkei roshiho no teisho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):329, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 72.)*

A new pleated round glass fiber sampler was designed to measure the dust concentrations in flue gas. A circular pleat was made on a round filter for the purpose of increasing filtration surface area. Filtration characteristics such as collection efficiency and filtration resistance were similar to those of existing cylindrical or round filters of borosilicate glass fiber and silica glass fiber. The new filter can be installed or removed more readily and with less chance of disturbing the filter surface or collected samples. The filtration surface area was increased from the 16 sq cm of a round filter of 55 inch diameter to 75 sq cm, while the overall length of the sampler was reduced.

60070 **APTIC NO. 80044**

Tanaka, A., M. Hori, and Y. Kobayashi

A STUDY ON THE FILTER COLLECTION OF HYDROGEN CYANIDE IN AIR FOR TRACE ANALYSIS. *(Firuta o mochiita taikichu biryo shianka suiso hoshoho no kento). Text in Japanese. Bunseki kagaku (Japan Analyst) (Tokyo), 24(10):624-629, Oct. 1975. 10 refs.*

A method for detecting trace concentrations of hydrogen cyanide in air was studied for the purpose of reducing sampling time. Hydrogen cyanide was captured by reacting it with a reagent coated on a filter. Alkali and nickel salts were examined as the coating reagent. The most suitable filter for collection is prepared by dipping a filter ordinarily used for aerosol collection into an aqueous solution of ammoniacal nickel chloride or nitrate. It is air dried and stored in a desiccator saturated with ammonia gas. The collection efficiency depends on the volume of sample air; it was more than 95% with air at a velocity of 5 m/min. The efficiency was little affected by variations of temperature and humidity and by the presence of sulfur dioxide or nitrogen dioxide in concentrations found in urban atmospheres. The recovery of hydrogen cyanide of the ppb order ranged from 90 to 100%, when the sample air was drawn into the filter at a flow rate of 200 l/min for 20 min using a high volume air sampler with a sampling area of 400 cu cm. (Author abstract)

60071 **APTIC NO. 83369**

Tarasov, V. V.

DETERMINATION OF HOMOLOGOUS MONOBASIC C2-C6 CARBOXYLIC ACIDS IN THE AIR BY PAPER CHROMATOGRAPHY. *(Opredelenie odnoosnovnykh karbonovykh kislot gemoliticheskogo ryada C2-C6 metodom* *khromatografii na bumage v vozdukhe). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 4:60-61, 1975.*

A paper chromatographic method for the quantitative determination of homologous monobasic C2-C6 carboxylic acids, emitted during oil extraction from cotton seeds, is described. Following sample on silica gel KSK and elution with hexane and ether, determination is made by means of a mobile phase consisting of a 10:3 ratio of n-butanol and 5% aqueous ammoniacal solution, using 0.1% alcoholic solution of methyl red and borate-phosphate buffer at a 1:2 ratio. The sensitivity amounts to 2 micrograms for each of the five homologs with the respective Rf values of 0.11; 0.19; 0.31; 0.47 and 0.60. Aldehydes of the C2-C5 homolog series, acrolein, and furfural do not interfere with the determination.

60072 **APTIC NO. 81999**

Teeters, Lloyd L.

FLAME AND CARBON MONOXIDE SNESOR AND ALARM CIRCUIT. *(Assignee not given.) U. S. Pat. 3,909,816. 5p., Sept. 30, 1975. 3 refs. (Appl. April 29, 1974, 5 claims).*

A relatively simple and inexpensive sensing and alarm system for detecting carbon monoxide emissions resulting from faulty gas burner operation is described. The device consists of a flame color sensing circuit, a carbon monoxide detection circuit, and an alarm circuit. The carbon monoxide detection element consists of a resistance means which changes its electrical resistance in the presence of carbon monoxide. The flame color sensing circuit utilizes a phototransistor.

60073 **APTIC NO. 82693**

Thatcher, John W.

THE DETERMINATION OF FREE SILICA IN AIRBORNE DUST COLLECTED ON MEMBRANE FILTERS. *Mining Enforcement and Safety Administration, Denver, Colo., Technical Support Center, Rept. 1021, 18p., 1975. 12 refs.*

An X-ray diffraction method for the determination of free silica in airborne dust collected on a polyvinyl chloride filter is described. The dust sample is liberated from the collecting filter by a dissolution technique and is transferred to a silver filter which is a more suitable sample substrate for X-ray diffraction analysis. Measurement of the transmission of a silver diffraction line through the sample provides a correction for sample absorption. The method is applied with good sensitivity to airborne dust samples of widely varying compositions collected in metal and nonmetal mines. Good agreement is obtained between the actual weight and analyzed weight for quartz samples collected in a dust chamber. The lower limit of detection for quartz 11 micrograms, and the range of application of the method extends to at least 8 mg of sample. (Author conclusions modified)

60074 **APTIC NO. 83084**

Thatcher, John W.

THE DETERMINATION OF FREE SILICA IN AIRBORNE DUST COLLECTED ON MEMBRANE FILTERS. *Mining Enforcement and Safety Administration, Washington, D. C., MESA Informational Rept. 1021, 18p., 1975. 13 refs.*

An X-ray diffraction method for the determination of free silica in airborne dust collected on a polyvinyl chloride (PVC) filter and transferred to a silver filter using a dissolution technique was developed. Measurement of the transmission of a silver diffraction line through the sample provides a correction for sample absorption. The method was applied with good sensitivity to airborne dust samples of widely varying compositions collected in metal and nonmetal mines. Good agreement was obtained between the actual weight and analyzed weight for quartz samples collected in a dust chamber. The lower limit of detection for quartz was 11 microgram and the range of application of the method extended to at least 8 mg of sample. (Author conclusions modified)

60075 **APTIC NO. 84463**

Thomas, S. H., E. D. Switala, and J. B. Lancour

AMBIENT MONITORING OF FLUORIDES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 12p., 1975. 6 refs. (Presented at the Air Pollution Control Association Southern Section Annual Meeting, 6th, Nashville, Tenn., Sept. 18-19, 1975.)*

The development of a program for the ambient monitoring of fluorides at a fiberglass facility is described. The program is required to demonstrate compliance with Tennessee regulations governing gaseous fluorides. Included in the program are economic and technical factors: cost/benefit analysis; qualifications of personnel conducting the program; number and location of monitoring stations; design of sampling stations; number size, and frequency of samples to be taken; duration of sampling program; and sampling and analytical procedures used during the program.

60076 **APTIC NO. 82977**

Tiefenau, Helmut Karl Ernst

OZONE MEASURING CELL. *(Max-Planck-Gesellschaft ZUR Forderung der Wissenschaften e.V., Gottingen (Federal Republic of Germany)) U. S. Pat. 3,888,754. 5p., June 10, 1975. 3 refs. (Appl. Nov. 8, 1973, 7 claims).*

An ozone measuring cell is described in which an O3 containing gas is conducted through a measuring chamber containing a potassium iodide solution. Electrodes connectable by means of a direct voltage source are dipped into two electrode chambers which are connected by a communicating capillary tube. The stream flowing between the electrodes due to the reaction between O3 and KI constitutes a measure for the O3 concentration in the gas. This is an improvement over a known O3 measuring cell in which the molecular iodine formed at the anode loop can rediffuse to the cathode and adulterate the measured value by integration. (Author abstract modified)

60077 **APTIC NO. 82466**

Timbrell, V.

ALIGNMENT OF RESPIRABLE ASBESTOS FIBRES BY MAGNETIC FIELDS. *Ann. Occupational Hyg., 18(4):299-311, 1975. 11 refs.*

The advantages of alignment of respirable asbestos fibers by magnetic fields in investigations of biological effects of asbestos are discussed. Their alignment in thin films or on membrane filters facilitates determination of diameter and length distributions using light and electron microscopes. Fibers aligned in thin film or in liquid suspension produce distinctive light-scattering patterns when illuminated by a laser beam. Photoelectric measurement of the light intensity distribution aids identification of the geographical source of the asbestos. It permits estimation of fibers in air samples and in dust recovered from human and animal lungs and provides indices of fiber size. (Author abstract modified)

60078 **APTIC NO. 79951**

Toda, Tadahide, Yoshihiko Imamura, and Kiyoshi Kobashi

AN APPROACH TO PREDICTING NO EMISSION IN SIE. *(Hibana tenka kikan ni okeru NO hassei ni kansuru yosoku keisan). Text in Japanese. Toyota Gijutsu (Toyota Eng.), 24(4):563-574, July 1975. 14 refs.*

A calculation model for predicting nitric oxide emission concentration from the wave-form of combustion pressure was developed for spark ignition engines. The procedure of calculation model development is described. For the calculation model of NC equilibrium concentration at maximum combustion temperature, based on the assumption of a uniform temperature of the combustion gas and taking into account the cycle variation, the calculated NO concentration was twice the measured value; however, it was in good agreement qualitatively. For the calculation model based on NO dynamics, temperature-time thermodynamics, and Zelodvich s reaction

mechanisms, the calculated NO concentration was in good agreement with the measured value for a wide range of operational factors. The simulation results using this calculation model indicated that NO concentration was reduced by the modification of cycle variation, and NO emission quantity unit work was reduced with an increase in heat loss.

60079 **APTIC NO. 80087**

Toi, K.

KITAGAWA TYPE VINYL CHLORIDE DETECTOR TUBE SC. *(Kitagawa-shiki enka biniru kenchikan SC gata). Text in Japanese. Enbi to Porima (Polyvinyl Chloride Polym.), 15(8):15, Aug. 1975. 11 refs.*

The Kitagawa type-SC vinyl chloride detector tube is described. Vinyl chloride monomer is oxidized in the reaction tube by chromium sulfate to produce hydrogen chloride. The HCl enters into a detection tube containing methyl yellow, which reacts with HCl and gives a pink color. The wavelength of the changed color in the detection tube measures the vinyl chloride concentration, which can be directly read from a calibration label printed on the tube. Suction of the sample air is carried out by attaching a syringe to the detector tube. Vinyl chloride concentrations up to 6.0 ppm can be determined in 10 minutes/sample with a detection limit of 0.1 ppm. Ethylene and acetylene present in the sample gas do not interfere with the vinyl chlordide determination. The presence of less than 200 ppm HCl in the sample gas does not interfere with the determination, since the absorbing agent in the reaction tube removes the HCl in the sample gas. The precision of the detector tube is comparable to that of the gas chromatography method.

60080 **APTIC NO. 82624**

Troxel, Norman R.

MAKING PARTICULATE EMISSION TESTS MORE MEANINGFUL. *Preprint, Research-Cottrell, Inc., Bound Brook, N. J., Source Testing, 18p., 3 refs. (Presented at the Specialty Conference on Air Pollution Measurement as it Relates to Regulation Compliance, New Orleans, La., Oct. 27-28, 1975.)*

Operating parameters of direct significance to meaningful particulate emission test results are reviewed along with the need for a universally accepted and truly reproducible particulate test method. A coal-fired boiler equipped with an electrostatic precipitator is used as an example. Factors affecting particulate loading include: input power to the precipitator, gas temperature in the precipitator, precipitator inlet loading, gas flow, and coal sulfur content. Various particulate testing procedures currently being used do not always give comparable results, and the Environmental Protection Agency Method 5 does not appear to be reproducible enough under field conditions to serve as the basis for determining compliance with regulations.

60081 **APTIC NO. 84110**

Tsuchida, Kiyoshi and Michio Ito

PROBLEMATIC POINTS OF THE AUTO-ANALYZER FOR NOX IN AMBIENT AIR. *(Kankyoyo chisso sankabutsu jidosokuteiki no mondaiten ni tsuite). Text in Japanese. Chiba-ken Kogai Kenkyusho Kenkyu Hokoku (Bull. Chiba Pref. Res. Inst. Environ. Pollut.), no. 3:89-96, March 1975. 5 refs.*

Automatic Saltzman analyzers for nitrogenn oxides were studied. There are 47 Saltzman NOx meters in Chiba Prefecture: 5 of these meters that are used at monitoring stations were selected for evaluation. The following procedures are discussed: accuracy differences in the five NOx meters; a precision test for reappearance, zero drift, span drift and the amount of collected color indicating absorption solution; reduced concentration of the color indicating solution; the stability of the flow of sampled air, the collection efficiency of the impinger, and the oxidation efficiency of the nitrogen monoxide oxidizer. The Saltzman NOx meters on the market showed significant differences in accuracy, even among products of the same manufacturer. The main causes of the differences were unstable air sample flow and the varying collection efficiencies of the impingers.

60082 **APTIC NO. 80090**

Turner, Alvis G. and Neal F. Hill

CALIBRATION OF THE ANDERSON 2000 DISPOSABLE AIR SAMPLER. *Am. Ind. Hyg. Assoc. J., 36(6):447-451, June 1975. 10 refs.*

A new cascade impactor type, two stage sampler designed to to collect and separate viable airborne particles which can be cultured in situ was studied. It was evaluated using a synthetically generated aerosol of dioctylphthalate/uranine in absolute alcohol. The sampler is an efficient instrument for collecting airborne particles in the size range 0.8 to 10.5 micron. Almost 100% of the microbiological aerosol particles in this size range were collected. The 50% effective cutoff diameter of stage 1 of this sampler is 8.0 micron for spherical particles. (Author abstract modified)

60083 **APTIC NO. 82475**

Turner, D., H. G. Baxter, G. M. Davies, A. R. Eyres, G. L. Lees, J. Mitchell, J. T. Sanderson, J. Steel, and J. P. Moore

METHODS FOR THE DETERMINATION OF THE ATMOSPHERIC CONCENTRATION OF OIL MIST. *Ann. Occupational Hyg., 18(4):293-297, 1975. 1 ref.*

Methods for sampling and analysis of mineral oil mists in atmospheric concentrations approaching the threshold limit value are reviewed. The most commonly employed methods consist of drawing air at a well defined rate through a preweighed gas fiber filter paper and recording the weight gain after a measured air volume has been sampled. If the weight gain indicates that the total particulate concentration in the work atmosphere is below 1 mg/cu m, then no further analytical action is required. General air samples are useful in very large workshops which employ numerous employees and where the contamination sources are widely and evenly distributed throughout the workroom. They can provide indications of gross changes in the oil mist control program, but may not be representative of the actual exposure of individual employees. A personal sampler is needed in which the air in the worker s breathing zone is sampled using a portable pump and an oil mist filter located as near to the worker s head as possible.

60084 **APTIC NO. 83951**

Uchiyama, Motohiro and Yoshitaka Takano

AIR POLLUTION SURVEY WITH THE RUBBER CRACKING METHOD. *(Gomu kurakkingu ho ni yoru taiki osen chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):382, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 129.)*

The rubber cracking method of determining atmospheric ozone levels is considered. The method used the deterioration of rubber tension strength upon exposure to ozone. The degree of deterioration determines the average ozone concentration. The rubber ring was designed to be suitable for 1-week exposures; however, 1-month average ozone determination was possible if the ozone level was not very high. The correlation of the ozone level by this method and the oxidant level measured by an automatic analyzer was 0.669. The rubber cracking method was not affected by nitrogen dioxide, sulfur dioxide, or chlorine gas.

60085 **APTIC NO. 83203**

Uchiyama, Shunichi, Ken Nozaki, and Giichi Muto

CONTROLLED POTENTIAL COULOMETRY OF NITROUS ACID AND NITRIC OXIDE USING IRON-NTA COMPLEX. *(Tetsu-NTA sakutai o mochiiru* *ashosan oyobi sanka chisso no teideni kurometori). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 317, 1975. (Presented at the Japanese Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 2L20.)*

Basic coulometric studies were conducted on the quantitative determination of nitrite ions and nitric oxide by means of iron chelate complexes. Nitrite ions react with the ferrous form of the chelate in acid, to produce NO and the ferric form of the chelate. Nitric oxide (NO) reacts with the ferrous form of the chelate to produce Ferrous-NO-Chelate (Fe(2+) (NO)NTA). In 10 ml of 0.001 M sodium nitrite solution, when the effectiveness of the electric current was over 99%, the accuracy of determination of nitrite ions was + or - 1%. For the determination of NO through Fe(2+) (NO)NTA, an accuracy of + or - 2% resulted.

60086 **APTIC NO. 83301**

Umhauer, Heinz

DETERMINATION OF PARTICLE SIZE DISTRIBUTIONS IN HIGH-CONCENTRATION AEROSOL FLOWS WITH A LIGHT SCATTERING APPARATUS. *(Ermittlung von Partikelgroessenverteilungen in Aerosolstroemungen hoher Konzentration mit Hilfe einer Streulichtmesseinrichtung). Text in German. Chem.-Ing.-Tech., 47(7):297, 1975. 2 refs. (The full-length text can be obtained from: Verlag Chemie GmbH, D-6940 Weinheim, Postfach 1260, West Germany).*

A light-scattering apparatus permitting the determination of particle size distributions in high-concentration aerosol flows is described. Measurements are possible to a concentration of 1,000,000 particles/cu cm at flow speeds of 2-20 m/sec. The smallest detectable particle sizes in 0.3 micron, and the ratio of the smallest to largest detectable particles is 1:20. A very small, optically delimited measuring space ensures at a high degree of probability that there is only one particle at one time within the measuring space. Thee light scattering apparatus is complete with a photomultiplier and pulse height analyzer.

60087 **APTIC NO. 81521**

Vol berg, N. S. and O. P. Sharikova

THE USE OF SORPTION TUBES TO SAMPLE AIR FOR SULFUR DIOXIDE DETERMINATIONS. *(Primeneniye sorbtsionnykh trubok dlya otbora prob vozdukha pri opredelenii dvuokisi sery). Atmos. Diffuz. Zagryazneniye Vozdukha, no. 325:152-160, 1975. 2 refs. Translated from Russian, 13p. (Presented at the Proceedings of the A. I. Voyeykov Order of the Red Banner of Labor Main Geophysical Observatory.)*

A sorption tube method for collecting air samples for sulfur dioxide determination is described. Glass powder (grain sizes of 1-2 mm) impregnated with a 2.5% solution of potash containing a 15% non-drying organic additive is used as the sorbent. The sorption tube traps SO2 with an efficiency of 98-99% when the air aspiration rate is 4 l/min. The advantages of the glass powder sorption tube over liquid absorption instruments with porous glass tile include the capacity for passing large volumes of air, compactness, simplicity of manufacture, low hydrodynamic resistance, and the possibility of sampling air at below freezing temperatures. (Author abstract modified)

60088 **APTIC NO. 83970**

Volberg, N. S., E. A. Gershkovich, and L. A. Konopelko

METEOROLOGICAL CASES OF GAS ANALYSIS IN AIR POLLUTION CONTROL. *(Osobennosti metrologicheskogo obespechenia gazoanaliticheskogo kontroloa zagriaznenia atmosfery). Text in Russian. Izmeritel. Tekhn., no. 6:75-76, June 1975. 4 refs.*

The problems of measuring small concentrations of toxic gases in the atmosphere are discussed. The existing methods are not precise enough, and vary from nation to nation, making it difficult to take a global approach to air pollution problems. The analysis must be simple and economical. Problems include the storage and transportation of toxic substances used in analysis. The development of analytical tools and methods should take the following main directions: the development of balloon methods of preparing, storing, and transporting gas mixtures; the construction of portable gas mixture units with high reliability, service time, stability, and reproducibility; the design of precise absolute stationary gas mixture units, and standardization of the units; development of methods of applying gas mixture equivalents which are used to determine the real concentrations of toxic gases; the design of automatic analyzers and controlled synthetic atmospheres.

60089 **APTIC NO. 76351**

Voorhees, Kent J., Fred D. Hileman, and Irving E. Einhorn

GENERATION OF RETENTION INDEX STANDARDS BY PYROLYSIS OF HYDROCARBONS. *Anal. Chem., 47(14):2385-2389, Dec. 1975. 8 refs.*

A method for generating a complete series of reference compounds in situ for gas chromatographic retention indices is described. The l-alkenes from ethylene to any desired molecular weight are produced by pyrolyzing the appropriate n-alkenes or polyethylene at 100 C in an inert atmosphere. The alkenes are related to the corresponding alkane by a delta I correction factor for a particular phase. A solid state copyrolysis technique is described along with a computer program for retention index searching of a master library. (Author abstract)

60090 **APTIC NO. 83991**

Wagner, Berndt and Kurt Pohl

OXIDATION OF NITRIC OXIDE TO NITROGEN DIOXIDE FOR NITROGEN OXIDES EMISSION MEASUREMENT ACCORDING TO THE SALTZMAN METHOD. *(Die Oxydation von NO to NO2 bei der Bestimmung von NOx-Emissionen nach der Saltzman-Methode). Text in German. Z. Chem., 15(3):111, 1975. 3 refs.*

An improved method for the oxidation of nitric oxide to nitrogen dioxide for the determination of total nitrogen oxides in air according to the Saltzman method is described. Nitric oxide is oxidized to NO2 by means of a solid catalyst. The latter is composed of manganous oxide prepared from manganous nitrate by heating at 750 C for 5 hr, after which the oxide is mixed with 35-40% monobasic potassium sulfate. The mass is then molded and dried at 200 C. Complete oxidation of NO can be achieved at 150-170 C in about 25 min. The method is applicable to nitrogen oxides concentrations of up to 3000 ppm and higher.

60091 **APTIC NO. 76601**

Wal van der, Jan F.

THE MEASUREMENT OF THE FINE DUST CONCENTRATION - SOME REMARKS. *(Die Messung der Feinstaubkonzentration - Einige Bemerkungen). Text in German. Staub, Reinhaltung Luft, 35(10):357-358, 1975. 4 refs.*

The conversion of measured fine dust concentrations into respirable dust concentrations (Johannesburg definition) is discussed. The influence of the particle size distribution of the sampled dust and of the sharpness of separation in the sampling apparatus are considered. The influence of the 50% value and the kind of industry are discussed. A small variation of the 50% value is likely to cause a considerable dispersion of the conversion factor. The dispersion may be decreased by deriving conversion factors for each kind of industry.

60092 **APTIC NO. 83486**

Walcher, H.

PHOTOELECTRIC MEASUREMENT OF DUST EMISSIONS. *(Die fotoelektrische Messung von Staubemissionen). Text in German. Feinwerktechnik Messtechnik F and M, 83(6):257-262, Aug.-Sept. 1975. 12 refs.*

The physical principles of photoelectric measurement of dust emissions, and practical solutions and instruments developed for this purpose are described. Electric eyes are unsuitable for smoke density measurement because of the variations of their characteristics with time. The autocollimation principle, in which emitter and receiver are housed in the same unit, and the attenuation of a beam reflected from a mirror in flue gas stack, is considered as best for dust emission measurement in view of the automatic reference signal obtained with a second beam. The optic surfaces must be kept dust-free by air blow. It is possible to guarantee a tolerance of + or - 2% relative to the zero point.

60093 **APTIC NO. 82842**

Walker, Alfred O.

APPARATUS AND METHOD FOR MONITORING THE PRESENCE OF VOLATILE ORGANIC LEAD COMPOUNDS. *(Nalco Chemical Co., Chicago, Ill.) U. S. Pat. 3,870,469. 4p., March 11, 1975. 6 refs. (Appl. April 30, 1973, 4 claims).*

An apparatus and method for continuously monitoring volatile organic lead compounds, such as alkly lead, in the atmosphere are described. The apparatus includes a tube of light transmitting material packed with iodine crystals, and means for driving an air stream through the tube. A photooptical sensor is adjacent to the tube and senses the presence of a predetermined amount of organic Pb compound by detecting the color of a coating on the inner surface of the tube. There is an alarm responsive to the triggering of the sensor. Other methods require visual observation by an operator through constant inspection procedures. (Author abstract modified)

60094 **APTIC NO. 84403**

Wallin, S. C. and P. Clayton

MEASUREMENT AND STANDARDS FOR POLLUTANT EMISSIONS FROM STATIONARY SOURCES. *Preprint, National Society for Clean Air, Brighton (England), 12p., 1975. 28 refs. (Presented at the National Society for Clean Air Spring Seminar, Newcastle upon Tyne, England, March 18-20, 1975.)*

Measurement and standards for pollutant emissions from stationary sources are reviewed. Essential steps in the measurement of emissions include: selection of sampling position; effluent flow rate; sample extraction and treatment; sample analysis; and data interpretation. Gaseous pollutants are measured using: conductimetric instruments (sulfur dioxide); colorimetric analyzers (nitrogen oxides, SO2); amperometric analyzers (SO2); electrochemical transducers (SO2, NOx, and carbon monoxide); flame photometric analyzers (sulfur compounds); non-dispersive absorption analyzers; dispersive absorption spectrometers; flame ionization detectors; and chemiluminescent analyzers.

60095 **APTIC NO. 83727**

Watanabe, Atuo

ANALYTICAL DEVICE FOR NITROGEN OXIDES AND ITS HANDLING METHOD. *(Chisso sankabutsu no bunseki sochi to sono toriatsukai ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 42(11):970-976, 1975.*

A nitrogen oxides analyzer developed by Fuji Denki is described. Gas was collected through a sampling port to a mist separator. The gas was then pumped to a drain separator where excess gas was separated. The resulting gas was passed through a dryer in which moisture was removed. Small particulates were separated with a pressure-resisting membrane. The gas was introduced through a three-way stopcock to a reactor cell at a constant flow rate after being passed through a millipore filter. Dry ozone was supplied from an ozone generator to the reactor cell. The quenching effect of carbon dioxide in the sample gas was significantly reduced by substantially increasing the air flow rate to dilute the reaction gas.

60096 **APTIC NO. 82628**

Weir, Alexander, Jr., Dale G. Jones, Lawrence T. Papay, Seymour Calvert, and S. Yung

MEASUREMENT OF PARTICLE SIZE AND OTHER FACTORS INFLUENCING PLUME OPACITY. *Preprint, World Health Organization, Geneva (Switzerland), Environmental Protection Agency, Washington, D. C., Nevada Univ., Las Vegas, American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York, American Meteorological Society, Boston, Mass., Inst. of Electrical and Electronics Engineers, New York, Instrument Society of America, Pittsburgh, Pa., Dept. of Transportation, Washington, D. C., National Aeronautics and Space Administration, Washington, D. C., and National Oceanic and Atmospheric Administration, Boulder, Colo., 14p., 1975. 11 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Plume opacity observations of trained smoke inspectors at a western coal-fired powerplant were compared with a theoretical model over a wide range of grain loadings, particle sizes, and stack diameters. Uncontrollable factors such as the sun s angle, the time of day, the day of the year, and the geographic location of the powerplant exerted a large influence on smoke plume opacity. Visual opacity varied from 14-87%, with particle size, stack diameter, and mass emission rate remaining constant. The use of an opacity standard to enforce a mass emission limitation is thus difficult to justify on a technical basis. (Author abstract modified)

60097 **APTIC NO. 83627**

Wessely, Istvan and Istvan Polay

MEASUREMENT DATA ACQUISITION FOR CLEAN AIR MAINTENANCE. *(Meresadatgyujtes a levegotisztasag-vedelemben). Text in Hungarian. Energiagazdalkodas, 16(8-9):416-419, Aug.-Sept. 1975.*

The DAPOMAC 211 system (Digital Air Pollution Measurement and Control) developed in Hungary for measurement data acquisitioning in air pollution monitoring and other automatic measuring systems is described. DAPOMAC 211, which can be considered as a special computer for data acquisition, consists of the following functional units: quartz-crystal-driven clock, control unit, store, arithmetic unit, analog multiplexer with REED relays, analog-digital converter, impulse counter, interface for data recorders (tape puncher, telex, teletype), and display unit with NIXIE tubes. The equipment generates averages and finds extremal values automatically, and prints out monitoring results at given intervals.

60098 **APTIC NO. 76506**

Whitby, K. T.

HIGH ACCURACY ELECTRICAL AEROSOL SIZE DISTRIBUTION AND CLASSIFICATION TECHNIQUES. *Minnesota Univ., Minneapolis, Environmental Div., Aerosol Meas. Technol. Colloq., Aachen, West Germany, 1975, p. 89-113. 38 refs. (March 4, 1975.)*

The basic principles of electrostatic sampling and size distribution measurement are reviewed. The particle charge versus size curves for bipolar, diffusion, and field charging are integrated with some of the latest aerosol size distribution models in order to calculate the response characteristics of the different kinds of electrical instruments.

60099 **APTIC NO. 83011**

Whitby, K. T. and B. Cantrell

ATMOSPHERIC AEROSOLS – CHARACTERISTICS AND MEASUREMENT. *Preprint, Minnesota, Univ., Minneapolis, Minn., Mechanical Engineering Dept., 6p., 1975. 25 refs. (Presented at the International Conference on Environmental Sensing and Assessment, Las Vegas, Nev., Sept. 14-19, 1975.)*

Some aspects of the characteristics of atmospheric aerosols are reviewed, including the bimodal mass distribution and chemical separation of the fine and coarse particles. Modeling of the size distribution and the chemical size distributions is discussed. Aerosols at the earth s surface and higher in the troposphere are considered. Some of the major measurement methods are also reviewed, along with the principal problems is applying each. The collection methods discussed include filtration and inpaction. Good prime calibration using monodisperse aerosols is a must if accurate particle sizing is to be done with in situ aerosol measurement instruments. It is necessary to evaluate their sampling efficiencies as a function of particle size. In the condensation nuclei counter the aerosol is saturated with water vapor and then expanded adiabatically to a lower pressure to produce conditions of supersaturation. Water vapor in the supersaturated atmosphere condenses on the condensation nuclei to form droplets which are measured optically by light transmission or light scattering principles. The size resolving instruments described include optical particle counters and the electrical aerosol analyzer. (Author abstract modified)

60100 **APTIC NO. 82626**

White, Charles L. and Gary M. Klauber

THE ACCURACY OF GROUND LEVEL DATA FROM AN AIR QUALITY MOVING LABORATORY. *Preprint, Environmental Measurements, Inc., Annapolis, Md., 14p., 1975. 2 refs. (Presented at the Specialty Conference on Air Pollution Measurement as it Relates to Regulation Compliance, New Orleans, La., Oct. 27-28, 1975.)*

Linear system theory involving the convolution integral and system function approach is used to develop a method for correcting air monitoring data distortion due to instrumental time response. The method is specifically applied to develop an algorithm for correcting data obtained from a total sulfur monitor used in a ground level mobile traversing mode. The algorithm is essentially exact and can be run within several minutes. The effect of correcting data in terms of plume parameters which are important in modelling studies and regulation formulation appears to be significant, with definite increases in plume maxima and a reduction of 10-20% in plume width being observed. (Author abstract modified)

60101 **APTIC NO. 81911**

Wimette, Harold, Rod Pilkington, and Tom Kelly

GUIDELINES FOR QUALITY ASSURANCE PROGRAMS FOR MOBILE SOURCE EMISSIONS MEASUREMENT SYSTEMS: PHASE III, LIGHT-DUTY DIESEL-POWERED VEHICLES - QUALITY ASSURANCE GUIDELINES (FINAL REPORT). *Olson Lab., Inc., Anaheim, Calif., Environmental Protection Agency Contract 68-02-1740, Program Element 1HA327, ROAP 26BGC, Rept. EPA-650/4-75-024-e, 23p., June 1975. 5 refs.*

Quality assurance guidelines for the measurement of light duty diesel powered mobile source emissions are presented within the framework of a total quality assurance system. The guidelines apply to quality assurance principles and techniques in the areas of procurement, standards and calibration, test quality control, data validation, and corrective action. Model quality management procedures which describe the relationships and responsibilities of various organization elements in a quality assurance program are outlined.

60102 **APTIC NO. 81912**

Wimette, Harold, Rod Pilkington, and Tom Kelly

GUIDELINES FOR QUALITY ASSURANCE PROGRAMS FOR MOBILE SOURCE EMISSIONS MEASUREMENT SYSTEMS: PHASE III, LIGHT-DUTY DIESEL-POWERED VEHICLES - TEST PROCEDURES (FINAL REPORT). *Olson Labs., Inc., Anaheim, Calif., Environmental Protection Agency Contract 68-02-1740, Program Element 1HA327, ROAP 26BGC, Rept. EPA-650/4-75-024-f, 26p., June 1975. 4 refs.*

Test procedures for the measurement of light duty diesel powered mobile source emissions are presented within the framework of a total quality assurance system. The procedures document the 1975 light duty diesel emission measurement test requirements presently in use at the Environmental Protection Agency s Ann Arbor facility. Presentation of the test procedures is in document control format, with quality assurance provisions being supplied for each part of the total testing system.

60103 **APTIC NO. 81913**

Wimette, Harold, Rod Pilkington, and Tom Kelly

GUIDELINES FOR QUALITY ASSURANCE PROGRAMS FOR MOBILE SOURCE EMISSIONS MEASUREMENT SYSTEMS: PHASE IV, HEAVY-DUTY GASOLINE ENGINES - QUALITY ASSURANCE GUIDELINES (FINAL REPORT). *Olson Labs., Inc., Anaheim, Calif., Environmental Protection Agency Contract 68-02-1740, Program Element 1HA327, ROAP 26BGC, Rept. EPA-650/4-75-024-g, 40p., June 1975. 13 refs.*

Quality assurance guidelines for the measurement of heavy duty gasoline powered mobile source emissions are presented within the framework of a total quality assurance system. The guidelines apply to quality assurance principles and techniques in the areas of procurement, standards and calibration, test quality control, data validation, and corrective action. Model quality management procedures that describe the relationships and responsibilities of the various organization elements in a quality assurance program are outlined.

60104 **APTIC NO. 81914**

Wimette, Harold, Rod Pilkington, and Tom Kelly

GUIDELINES FOR QUALITY ASSURANCE PROGRAMS FOR MOBILE SOURCE EMISSIONS MEASUREMENT SYSTEMS: PHASE IV, HEAVY-DUTY GASOLINE ENGINES - TEST PROCEDURES (FINAL REPORT). *Olson Labs., Inc., Anaheim, Calif., Environmental Protection Agency Contract 68-02-1740, Program Element 1HA327, ROAP 26BGC, Rept. EPA-650/4-75-024-h, 36p., June 1975. 4 refs.*

Test procedures for the measurement of heavy duty gasoline engine mobile source emissions are presented within the framework of a total quality assurance system. The procedures are a documentation of the 1975 heavy duty gasoline engine emission measurement test requirements presently in use at the Environmental Protection Agency s Ann Arbor facility. Presentation of the procedures is in document control format, with quality assurance provisions being outlined for each part of the total testing system.

60105 **APTIC NO. 81908**

Wohlschlegel, Pamela and D. E. Wagoner

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM: VOLUME IX - VISUAL DETERMINATION OF OPACITY EMISSIONS FROM STATIONARY SOURCES. *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1234, Program Element 1HA327, ROAP 26BGC, Rept. EPA-650/4-74-005-i, 95p., Nov. 1975. 13 refs.*

Guidelines for implementing a quality assurance program for the visual determination of the opacity of emissions from stationary sources are presented. The guidelines are preceded by a list of the overall objectives of a quality assurance program and the program components necessary to accomplish the given objectives. The guidelines include: a description of the Federal reference method for opacity determination, operational procedures, a plan activity matrix, and auditing procedures. A functional analysis of the test method is outlined in terms of variable evaluation and error range data, the combining of error terms, and the use of precision estimates.

60106 **APTIC NO. 84626**

Yamada, Yukinobu, Yoshikazu Takatsuka, Hirohisa Shima, Senichiro Shirai, Ryozo Naito, Noriyoshi Ito, and Motohide Murata

ACID MISTS FROM STATIONARY COMBUSTION. *(Koteihasseigen ni okeru san misuto ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):541, 1975. (Presented at Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 277.)*

Sulfuric acid mist and dust generated by heavy oil boilers were analyzed by the Commins method, using a glass filter. The amount of sulfuric acid mist was greater at the chimney exit than at the entrance in 4 out of 5 boilers tested. Using the same samples, the Commins method was compared to the turbidity method for analysis of sulfuric mist. The correlation factor between the two methods was high, 0.995.

60107 **APTIC NO. 82061**

Yamate, Noboru and Toshio Matsumura

SPECTROPHOTOMETRIC DETERMINATION OF ACROLEIN IN AMBIENT AIR. *(Taikichu no akurorein no kyukokodoho ni yoru sokutei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):320, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 62.)*

An accurate quantitative analytic method for airborne acrolein, using the 4-hexyl-resorcin method (4-HR) in which sodium hydrogen sulfite solution is used for absorption of acrolein is described. This analytic method can measure acrolein above 3 ppb with the following specifications: 240 of test material, and 10 ml of absorption solvent. The conventional 4-HR method using ethyl alcohol or a mixed test solution containing 4-HR as an absorption solvent, and the new 4-HR method using sodium hydrogen sulfite as an absorption solvent, were simultaneously applied to measure airborne acrolein in Tokyo. The new method accurately measured the volume of acrolein and the solvent turned blue, while the conventional 4-HR method could not detect any acrolein, and the solvent turned red. Acrolein kept in the test solvent was stabilized for 4 hour at 5 C, and the acrolein collection rate was 93% with one absorption tube and 98% when two tubes were used.

60108 **APTIC NO. 84125**

Yamate, Noboru and Toshio Matsumura

THE EFFECT OF OZONE ON NO2 DETERMINATION BY NOX AUTO-ANALYZER WITH SALTZMAN REAGENT. *(Zarutsuman shiyako mochiiru chisso sankabutsu jido keisokuki no nisankachisso sokutei ni okeru ozon no eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):294, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 34.)*

The effect of ozone on nitrogen dioxide determination by both continuous and non-continuous auto-analyzers with Saltzman reagent was studied. In the continuous analyzer, the NO2 reading decreased by 15 to 36% with the presence of ozone even if the concentration ratio between ozone and NO2 was 1. No ozone effect was observed in the determination of 0.05 ppm level NO2 by the non-continuous analyzer even if the concentration ratio was 10. For the determination of NO2 levels greater than 0.15 ppm by the non-continuous analyzer, ozone interference began when the concentration ratio was greater than 3. The use of an ozone decomposition apparatus in front of the spiral tube would be necessary for the determination of NO2 by continuous auto-analyzer, while ozone interference was not significant for the non-continuous auto-analyzer.

60109 **APTIC NO. 84701**

Yamauchi, H., M. Yoshida, and Y. Yamamura

DETERMINATION METHODS OF INORGANIC LEAD AND ALKYL LEAD COMPOUNDS IN ATMOSPHERE. *(Taikichu no mukien, arukiruen kagobutsu no bunbetsu teiryoho ni tsuite). Text in Japanese. (Sei Marianna Ika Daigaku Zasshi (St. Marianna Med. J.), 3(1):57-60; March 1975. 9 refs.*

If the presence of tetraalkyl lead is suspected, measurement and analysis of both inorganic lead and tetraalkyl lead must be made. Inorganic lead aerosol is trapped by a glass fiber filter, according to a new method. Alkyl lead is trapped by potassium iodide solution, and both solutions are measured by atomic extinction. It is possible to measure a 0.1-80 microgram/cu m alkyl lead concentration, when it is trapped at a 1 liter flow for 8 hr. This means it is an effective method of measuring tetraalkyl lead in the atmosphere and in the work environment where tetraalkyl lead is used. Measurement was made at major highways in Tokyo, where alkyl lead in the atmosphere was not detected. However, 1.7 microgram/cu m alkyl lead on the average was measured around a gasoline station in Tokyo. Although the traditional method of measuring is equipped with a glass fiber filter for the purpose of trapping inorganic lead, with this method, lead in aerosol is not trapped by a glass fiber filter, but is trapped by an alkyl lead trapping solution. With this method, 75 microgram/cu m concentrations (the tolerance for work environments as recommended by the Japan Industrial Hygiene Society), can be measured.

60110 **APTIC NO. 82942**

Yamazaki, Hiroyasu, Kazuhiro Kuwata, and Ken Matsuo

COLLECTION OF ATMOSPHERIC PHTHALIC ACID ESTERS USING POLYURETHANE FOAM PLUGS. *(Poriuretan fomu puragu ni yoru taikichu no futarusan esuteru no hoshu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):322, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 64.)*

Two pieces of polyurethane foam (50 mm thick, 23 mm diameter) were packed in a glass tube with 20 mm diameter in series. A Whatman GF-A filter was attached to the tube. Eighty cu m of room air were sucked through the tube from the filter side for 48 hr. The soxhlet extraction for the filter and polyurethane pieces was separately made using n-hexane for 2.5 hr, and the n-hexane solution was concentrated to 10 ml for gas chromatography injection to determine the dibutyl phthalate and diethyl phthalate. Most of the phthalic acid esters were trapped by the filter and the first polyurethane piece. Dibutyl phthalate trapped in the second polyurethane piece was less than 0.6% of the total dibutyl phthalate trapped in the tube, while diethyl phthalate trapped in the second piece was less than 1%. The trapping efficiency of the Whatman filter for dibutyl phthalate was less than 2% of the total dibutyl phthalate trapped in the tube; the trapping efficiency for diethyl phthalate was around 50%.

60111 **APTIC NO. 82821**

Yamazaki, Masao, Hajime Shirayama, and Shuichi Okumura

ANALYSIS OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AMBIENT AIR. *(Kankyo taikichu no takan hokozoku tankasuisorui no bunseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):203, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 90.)*

Analysis methods for atmospheric polynuclear aromatic hydrocarbons were evaluated. Samples collected by high-volume air sampler and extracted by vacuum sublimation were (1) separated by two-layer two-dimensional thin-layer chromatography and determined by fluorescence spectrometry and (2) separated and determined simultaneously using high-speed liquid chromatography equipped with fluorescent spectrometry. The sample recovery rate of the vacuum sublimation procedure, measured by placing a known amount of benzo(a)pyrene on glass fiber, followed by sublimation extraction and determination by fluorescence spectrometry, was about 90%. The sample recovery rate of the thin-layer chromatographic separation procedure, measured using a known amount of benzo(a)pyrene by the abovementioned method, was more than 85%. For the column separation, the theoretical plate was about 5400, which was about 10 times higher than that of the existing column. The atmospheric benzo(a)pyrene concentration measured by the thin-layer chromatographic procedure was 0.7 microgram/1000 cu m at highway no. 8, 190 microgram/1000 cu m at a carbon electrode plant, and 530 microgram/1000 cu m at an aluminum refinery.

60112 **APTIC NO. 82941**

Yamazaki, Tomio, Masahiko Tsuji, Toshihide Okuno, and Kozo Shintani

MEASUREMENT OF VINYL CHLORIDE MONOMOER IN ATMOSPHERE. *(Taikichu no enka biniru monoma no sokuteiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):316, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 58.)*

An analytical technique for measuring atmospheric vinyl chloride monomer was studied by collecting the air sample with a polyester bag, followed by gas chromatography. From 1 to 10 liter of the collected air was concentrated onto a firebrick powder column cooled by liquid oxygen. The column temperature was increased to 10 C in water, and the concentrated vinyl chloride monomer was then eluted from the column into a second absorption column (molecular sieve SA) to separate the condensed water. The vinyl chloride monomer was analyzed from the latter column by GC. Several GC columns were tested. Interference by other hydrocarbons with vinly chloride monomer determination was observed in the TCP and Porapac-Q columns; however, the activated carbon column (15 cm long, 2 mm diameter) gave satisfactory separation. The retention time of vinyl chloride monomer was 2.2 min at a column temperature of 180 C with a carrier gas flow of 1 kg/sq cm. Of 19 hydrocarbons examined, only dichlorodifluoro-methane gave the same retention time as vinyl chloride monomer under the above GC conditions. No loss of vinyl chloride monomer within the sampling bag was observed up to 48 hr.

60113 **APTIC NO. 80341**

Yanagisawa, Shinichi

DETERMINATION OF AIR POLLUTANTS. *(Taiki osen busshitsu no keisoku). Text in Japanese. Preprint, Society of Instrument and Control Engineers, Kansai Section, p. 19-23, 1975. (Presented at the Determination of Environmental System and Modeling Symposium, Osaka, Japan, Sept. 18, 1975.)*

Ten methods of air pollutant determination are briefly summarized. Methods and pollutants involved are as follows: solution conductivity sulfur dioxide; absorption photometry nitric oxide; nitrogen dioxide oxidant; hydrogen fluoride; aldehyde; hydrogen sulfide; chlorine; coulometric titration (H2S; SO2; oxidant); ion electrode (SO2; HF; chlorine; non-dispersive infrared absorption (CO); chemiluminescence (ozone; nitrogen oxides); hydrogen flame ionization (FID) hydrocarbons; atmospheric carbon monoxide; flame photometry (FPD) (SO2; H2S; mercaptan; phosphorus compounds; high sensitivity to sulfur: (0-0.1 ppm total sulfur); electron capture in combination with gas chromatography (peroxyacetyl nitrate); filter paper coloration (H2S; chlorine).

60114 **APTIC NO. 84222**

Yanagisawa, S.

PROBLEMS OF ATMOSPHERIC ANALYSIS. *(Taiki bunseki no mondaiten). Text in Japanese. Kankyo to Sokutei Gijutsu (Environ. Measure. Technol.), no. 16:8-15, April 1975.*

Although the directive from the Environmental Agency is to make the phenoldisulfonic (PDS) method the standard measurement method of nitrogen oxides, it should be replaced by Zn-NEDA (naphthylethylenediamine), since the latter is much easier to handle and gives more accurate analysis. Because of the presence of ozone, the standard for nitrogen oxides has been kept too low, as it is now realized in the U. S. It is time for Japan to review the past data. In analyzing ozone, the use of impinger type absorption bottles is recommended to be adopted as a Japanese Industrial Standard. In Japan, the GC method of carbon monoxide standard sample is the only method of comparison approved by JIS, but either the CVA method or chemical analysis method should be adopted.

60115 **APTIC NO. 81746**

Yasui, Shigeo, Koichi Shiomi, and Akikazu Kagoya

ADVANCED SEPARATION ANALYSIS OF ATMOSPHERIC TRACE COMPONENTS BY TENAX TRAP CONCENTRATION-CAPILLARY COLUMN METHOD. *(TENAX torappu noshuku-kyapirari karamu hoshiki ni yoru taikichu biryo seibun no kobunri bunseki). Text in Japanese. Preprint, Japan Society for Analytical Chemistry, Tokyo, p. 204, 1975. (Presented at the Japan Society for Analytical Chemistry, Lecture Meeting, 24th, Sapporo, Japan, Oct. 1-5, 1975, Paper 1D23.)*

The TENAX trap technique for the advanced separation of atmospheric organic solvents is described. The TENAX tube (6 mm diameter by 150 mm length) was used to trap organic solvents at room temperature. Upon the heating of the TENAX tube, the trapped gases was liberated and further separated by 2 successive precolumns; the first precolumn was OV-1.2% on CW, and the second was an analytical capillary column. The adsorption-heat liberation treatment was also done in these two precolumns. The liberated gases from the second precolumn were analyzed by gas chromatography equipped with an analytical capillary column and flame ionization detector. The separator by the three-step concentration method allowed advanced separation of organic solvents. With the TENAX tube described above, the concentration of 8 liter butanol, benzene, cyclohexane, or ethyl acetate was possible at room temperature. The atmospheric analysis of these compounds in ppb level is possible by this method.

60116 **APTIC NO. 84176**

Yasuoka, Takashi, Shunmei Mitsuzawa, and Masaki Mori

ANALYSIS OF AIR POLLUTANTS BY ULTRAVIOLET RAY IONIZATION METHOD, PART 2. *(Shigaisen ionkaho ni yoru taiki osenbutsu no buseki, II). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):288, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 26.)*

The ultraviolet ionization method is described. The resonance lines of krypton (1236 A) and xenon (1470 A), and the spectrum (1600 - 1000 A) of a hydrogen discharge lamp were used. For the lamp, three different band-pass filters were used. Analysis was possible by separating the pollutants into three groups with respect to the ionization potentials; less than 4.83 eV, 8.43 - 10.03 eV, and greater than 10.03 eV. The pollutants were irradiated by an appropriate light, and the amount of the ion current generated was measured. The ion current generated was affected by the light intensity, therefore calibration of the instrument was necessary, and such calibration could be done by using a standard nitric oxide gas diluted with nitrogen. By using the krypton resonance line and 10W microwave output power, a linear calibration curve of NO could be obtained up to 10 ppm; the ion current generated for this nitric oxide concentration range was up to 0.8 times 10 to the - 9 power ampere.

60117 **APTIC NO. 76302**

Yatabe, Teruo

CORRECTION METHOD FOR MEASURED LOW LEVEL SULFUR DIOXIDE CONCENTRATION IN ATMOSPHERE BY CONDUCTOMETRIC SULFUR DIOXIDE ANALYZER: STUDIES ON DETERMINATION OF SULFUR OXIDES IN ATMOSPHERE, PART X. *(Teinodo iki ni okeru AP meta shijichi no hosei hoho: Taikichu no io sankabutsu sokutei ho ni kansuru kenkyu. Dai 10 po). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind., Rept.), no. 74095:1-16, May 1975. 4 refs.*

Field investigations on sulfur dioxide concentrations were carried out at 28 locations using 7 AP meters from 2 manufacturers, and field techniques were compared. From 54.5 liter to 118 liter of air were sampled. Loss of absorbent due to evaporation was calculated from atmospheric temperature, humidity, and the temperature of the absorbent, and corrections were made in the results directly obtained from the AP meters. The results were compared to those obtained by the West-Gaeke method, using a wet type gas meter for sampling. The SO2 concentrations obtained by the AP meters were approximately 10 ppb higher than those by the West-Gaeke method, but the corrected values were in good agreement with the latter. The correction method could be used for low level SO2 concentrations (below 0.05 ppm).

60118 **APTIC NO. 82105**

Yatabe, Teruo

ERROR OF AUTO-MEASURING APPARATUS. *(Taiki osen jido keisokuki no gosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):248-254, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975.)*

Automatic measuring instruments for air pollution play a significant role in solving air pollution problems. The Agency of Industrial Science and Technology has been engaged in standardization of automatic measuring instruments. Errors made by these instruments can be classified into errors of precision and errors of accuracy. These errors are discussed, using a sulfur dioxide automatic measuring instrument. In Japan, the most common automatic measuring instrument for sulfur dioxide using the solvent electric conductivity method has a measuring range of 0-0.2 to 0-1.0 ppm. The errors of precision for airborne sulfur dioxide was below 6% of the fluctuation coefficient; the error of accuracy must be reduced or revised.

60119 **APTIC NO. 80072**

Yoshida, Hiromi, Masayoshi Okamoto, Tetsuya Gatayama, and Shigeyoshi Kojima

OBSERVATION OF SUSPENDED PARTICULATE IN LOWER ATMOSPHERE WITH LASER RADAR. *(Reza reda ni yoru taiki chu no fuyufunjin no rittai kansoku). Text in Japanese. Toshiba Rebyu (Toshiba Rev.), 30(8):591-594, July 1975. 9 refs.*

The concentration distribution of suspended particulates was measured using a high-repetition-rate giant YAG laser in Kawasaki and Osaka. Descriptions of the laser radar system and the data analysis method are given. The relationship between the intensity of Mie-scattering and the suspended particulate concentration of 30 m was linear, and the correlation coefficient was 0.91. Particulate concentrations measured at 90, 270 and 390 m by laser and aircraft were also in good agreement. Cross sections of suspended particulate concentrations in a horizontal plane (100 m) and a vertical plane measured on Aug. 28, 1973 indicated that the phenomenon of concentration inversion occurred in the lower atmosphere at wind velocities of less than 2 m/s, and that the concentration distribution was greatly affected by wind direction and velocity. The laser radar provides vital information for air pollution monitoring and will contribute much to air pollution study, especially to photochemical simulation.

60120 **APTIC NO. 82939**

Yoshiyama, Hidenori and Yukio Tamori

EFFECTS OF HUMIDITY FOR LIGHT SCATTERING DUST MONITORS. *(Hikari sanranshiki funjinkei no shitsudo ni yoru eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):359, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 105.)*

The effect of humidity on dust concentration measurements by nephelometers, digital dust indicators, particle counters, and particle mass monitors was examined. In laboratory studies, the instruments were not affected when the relative humidity was increased from 60% to 100% in 1 hr. When the humidity was increased from 60% to 90% in 5 min, the nephelometer indicated a minute-1 reading of 0.05 mg/cu m, and the particle counter showed a 1.5 to 3.0 fold increase for the counting of particles greater than 0.3 micron. The four instruments were compared by measuring atmospheric dust. During a rain period, the measured value ratio between the nephelometer and particle mass monitor increased to 2 to 3, and that between the digital dust indicator and particle mass monitor was 0.7 to 1.0. These ratios during no-rain period were 1.0 to 1.7 and 0.4 to 0.6, respectively.

60121 **APTIC NO. 82424**

Zanker, A.

NOMOGRAPH TO CALCULATE THE RESULTS OF ANALYSIS OF A STACK GAS CONTAINING H2S AND SO2 SIMULTANEOUSLY. *Lab. Pract. (London), 24(2):95-96, Feb. 1975.*

A relatively simple analytical method has been developed, which allows the determination of the percentage of hydrogen sulfide and sulfur dioxide simultaneously in a stack-gas, by means of two subsequent titrations of the same gas sample. Equations for the volume percentages of H2S and SO2 are given. A nomograph was constructed according to both equations, using only one movement of a ruler. Quantities obtained in the titrations appear on the side scales of the nomograph. A ruler connecting the values obtained for these quantities intersects the central scales for H2S and SO2 percentages in stack gas. The results for each gas are read on the intersection points of the ruler with the appropriate scales. If the ruler intersects both central scales, both H2S and SO2 are present. If it intersects only one scale, the other pollutant is absent.

60122 **APTIC NO. 84062**

Zmudzinski, V., M. Lewandowski, and T. Fronska

AUTOMATED CONTROL OF ENVIRONMENTAL POLLUTION IN METALLURGICAL PLANTS. *(Automatisierte Kontrolle der Umweltverschmutzung in metallurgischen Werken). Text in German. Neue Huette, 20(12):721-726, Dec. 1975.*

Metallurgical plants rank among the principal dischargers of dust, sulfur dioxide, carbon monoxide, and other pollutants into the atmosphere. The technological sector should establish continuous controls for air pollutants resulting from production processes and determine the harmful effects of such contaminants on the environment. Measuring techniques for dust concentration and analysis of gases are classified as direct, with gas sampling and gravimetric analysis, or indirect, depending on color changes, pressure distribution, and electrical conductivity. The structure of environmental protection services in modern plants should have an important part in emissions control although the regulatory stations require economic considerations as well. For prognostication of future air pollution a statistical approach and a mathematical model, which is based on contaminant propagation in a given area, have been developed. Controlled treatment of waste waters, analyzed by automatic titration, colorimetry, and continuous potentiometry, is described along with techniques for neutralization of acid waste water and stabilization of lime water.

60123 **APTIC NO. 83030**

Zolner, W. J. and D. A. Helm

MULTIPOINT SAMPLING OF NOX USING A TOTALLY HEATED EXTRACTIVE TECHNIQUE. *Preprint, Thermo Electron Corp., Waltham, Mass., 8p., 1975 (?).*

A chemiluminescent monitor for the multipoint sampling and analysis of nitric oxide and nitrogen oxides is described which dies not require the removal of water from the sample. The concept used in thie emission monitor is to heat the gaseous sample above its dew point until the pressure can be reduced to a level where condensation does not occur at room temperature. Since the basic measurement of NO in the chemiluminescent analyzer can be performed at reduced pressure, this analytic technique is particularly useful. In addition, the chemiluminescent technique is insensitive to the water vapor content of the sample being analyzed. The totally heated extractive technique is well suited for measuring NO or nitrogen dioxide in process streams where water vapor and/or particulates are present.

60124 **APTIC NO. 82282**

Zutshi, P. K. and T. N. Mahadevan

A NEW AND CONVENIENT TECHNIQUE OF USING LEAD PEROXIDE FOR ESTIMATING ENVIRONMENTAL SULPHATION RATES. *Indian J. Environ. Health), 17(2):111-113, April 1975. 9 refs.*

A method is described for using electrodeposited lead peroxide on graphite for estimation of environmental sulfation rates (sulfur dioxide). Monthly average sulfation rates are monitored for 6 months with both electrodeposited graphite and lead peroxide coated petri dishes. The electrodeposited plates are reproducible between themselves and agreed with the lead peroxide mucilage petri dishes. The electrodeposited plates last for several years and are more rugged than the lead peroxide mucilage petri dishes. (Author abstract modified)

60125 **APTIC NO. 76157**

Environmental Protection Agency, Research Triangle Park, N. C., Criteria and Special Studies Office

ANNUAL CATALYST RESEARCH PROGRAM REPORT. APPENDICES, VOLUME III (ANNUAL REPORT). *Program Element 1AA002, Rept. EPA-600/3-75-010d, 243p., Sept. 1975. 26 refs.*

An appendix dealing with the development of standardized measurement methods for routinely assessing particulate, sulfate and sulfur dioxide emissions from non-catalyst and catalyst equipped motor vehicles is presented as part of the annual report of the Environmental Protection Agency s Office of Research and Development Catalyst Research Program. Specific topics covered include: the development of methods for analyzing total sulfur, sulfate, and other sulfur compounds in motor vehicle particulate emissions; the adaptation of stationary source methods for the measurement of sulfates and SO2 in motor vehicle exhaust; an automated method for the determination of soluble sulfates in diluted exhausts; engine room dilution tube flow characteristics; protocols for characterizing gaseous and particulate emissions as a function of fuel and additive composition; and the validation of engine dynomometer test protocols for control system performance.

60126 **APTIC NO. 76550**

Working Group for Airborne Dust Measurement (Japan), Subcommittee on Air Environment

SUSPENDED PARTICULATE DETERMINATION METHOD IN THE FIELD OF CONSTRUCTION (4). *(Kenchiku no bunya ni okeru fuyufunjin nodo no sokuteiho (4)). Text in Japanese. Kenchiku Zasshi (J. Architecture Build. Sci.), 90(1100):999-1001, Nov. 1975. 4 refs.*

Suspended particulate determination methods in the field of architecture and building science are reviewed. Measurement methods can be classified into three categories by the objective of measurement, which are: concentration characteristic measurement method (accurate measurement); common measurement method (simplified measurement); and specific measurement method for specified purposes. Descriptions of measurement procedures, preliminary investigation methods; limits of measurement, and characteristics of measurement instruments in each category are given. The characteristics and classification of measurement instrument, selection of measurement instrument, correlation between instruments and subjects of measurement location, and measurement time are also reviewed.

60127 **APTIC NO. 76551**

Working Group for Airborne Dust Measurement (Japan), Subcommittee on Air Environment

SUSPENDED PARTICULATE DETERMINATION METHOD IN THE FIELD OF CONSTRUCTION (3). *(Kenchiku no bunya ni okeru fuyufunjin sokuteiho (3)). Text in Japanese. Kenchiku Zasshi (J. Architecture Build. Sci.), 90(1099):901-907, Oct. 1975. 14 refs.*

Suspended particulate determination methods in various fields are reviewed, including measurement methods in the field of industrial hygienc, measurement methods complying with the building maintenance regulations, measurement methods for clean room requirements, measurement methods in air filter testing, measurement methods pertaining to air pollution, and measurement methods in accordance with the air testing method of the Japan Pharmaceutical Association. Measurement items, indication methods for particulate concentration, a description of measurement and sampling iustruments, and a description of various measurement procedures are reviewed systematically.

60128 **APTIC NO. 76629**

Assoc. of Machine Advancement (Japan), New Machine System Center

AIR POLLUTION MONITORING AND CONTROLLING SYSTEM. *(Taiki osen jitsujikan kanshi seigyo sisutemu ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(9):829-838, 1975. 7 refs.*

The development process of an on-line air pollution monitoring system (APMS) designed for constant monitoring of environmental concentration and emission quantity of sulfur oxides and related meteorological conditions at a large scale industrial complex, forecasting SOx concentration 3 to 6 hr ahead, and transmitting instructions to emission sources for SOx emission reduction is described. Investigation results of field tests (basic data and diffusion simulation data), meteorological factors (meteorological data from 1966 to 1972 were compiled and statistically analyzed), and diffusion calculation methods (evaluation of various diffusion models) were compiled. Based on the information obtained, the APMS software system (measured data gathering program, pollutant concentration forecasting program, filing program, and master schedule program) and hardware system (measured data gathering system, data reduction and filing system, pollution concentration forecasting operation system and emission source control information transmission system) were developed. The APMS project was initiated in the summer of 1974. The evaluation of the forecasting model has been conducted since June 1975. After one year of evaluation and modification, it is scheduled to be completed as a practically applicable system.

60129 **APTIC NO. 80133**

ESTIMATION OF TOXIC GAS AMOUNT BY CHEMICAL REACTION EQUILIBRIUM THEORY. *(Kagaku hanno heikoron ni yoru yudo gasu hasseiryo no suite). Text in Japanese. Toyota Chuo Kenkyusho R D Rebyu (Toyota R and D Review), 11(1):52-57, Sept. 1975. 1 ref.*

An estimation method for toxic gas concentrations (unreacted hydrocarbons, carbon monoxide, nitric oxide) in internal combustion engine exhaust gas, based on chemical reaction equilibrium theory, is described. Descriptions of Vickland's calculation method for component concentrations in combustion exhaust gas maintained at given temperature and pressure are given with an example of calculation of octane combustion product concentrations. Concentrations of hydrogen, carbon dioxide, CO and NO in exhaust gas obtained by normal combustion of octane and maintained at 1000-5000 K at 50 atm were calculated. Calculated values and measured values obtained using a four cylinder Toyota 2T gasoline engine were in fairly good agreement, indicating that the rough estimation of component concentrations in exhaust gas could be made by the equilibrium theory.

60130 **APTIC NO. 80647**

Energy and Environmental Analysis, Inc., Arlington, Va. and AVRAM Co., Falls Church, Va.

APPENDIX 2. ATMOSPHERIC SULFATE CHARACTERIZATION AND MEASUREMENT. *In: An Analysis of the Automotive Sulfate Question, Manufacturers of Emission Controls Association Contract, 30p., 1975. 26 refs.*

Characteristics of atmospheric sulfates are reviewed along with methods for their measurement. Sulfate compounds in air are primarily the result of oxidation reactions involving sulfur dioxide, sunlight, reactive smog components, and/or catalytically active aerosols. Present ambient levels of sulfates which are attributable to atmospheric conversion of sulfur dioxide are often over 20 microgram/cu m in industrialized regions; these levels are well above those now being considered by the Environmental Protection Agency as being hazardous to public health (over 10 microgram/cu m for 24 hr). The most commonly used method for determining ambient sulfates is to analyze particulates collected on the surface of high volume sampler filters. Presently, there is no commercially available instrumentation to continuously monitor total particulate sulfates or sulfuric acid. Current methods of measuring sulfates display the following shortcomings: the specific chemical nature of the sulfate compounds are not indicated; the size distribution of the sulfate containing particulates is not differentiated; and artifact sulfates are produced due to reactions of sulfur dioxide on the filter surface. (Author summary modified)

60131 **APTIC NO. 81079**

Weston (Roy F.), Inc., West Chester, Pa.

INSTRUMENT TEST REPORT DUPONT MODEL 461 NOX ANALYZER (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0240, Proj. 73-NTA-1, Task 6, Rept. 73-NTA-1, 21p., Nov. 1975.*

Information was obtained on performance and attendant methodology to determine the acceptability of a continuous monitoring system for oxides of nitrogen emissions at a nitric acid plant. The analyzer conditioning test, the operational period test, and the retest were conducted considering only one unit; however, during the 10-month continuous monitoring test, data were recorded from an additional unit. Aspects considered include the reliability of the continuous monitor's operation, guideline specifications for monitors during performance testing, costs, the effect of process operational variations on emissions, and the feasibility of using a continuous monitor for compliance testing. Instrument performance was monitored to determine that the Environmental Protection Agency specifications were satisfied; the analyzer was tested for calibration error, relative accuracy, 2-hour and 24-hour calibration and zero drift, and response time. Maintenance procedures, including daily calibration, changing the chart and magnetic tape monthly, cleaning the sample line and sample cell semiannually, recharging chart ink monthly, and annual inspection were evaluated. The average cost of installation is approximately $18,000 for each analyzer. The testing included a 1-week conditioning, a 1-week operational period test, a partial operational period retest, and a 10-month continuous monitoring test. The specifications for 2-hour and 24-hour calibration drift and calibration error were not met in the initial operational test, nor for 24-hour calibration drift in the retest. Corrective maintenance was performed on the monitoring system between the initial test and the retest. The continuous monitoring test program is discussed in terms of instrument performance and maintenance, process interruptions, and operational manpower requirements. (Author abstract modified)

60132 **APTIC NO. 81191**

Weston (Roy F.), Inc., West Chester, Pa.

INSTRUMENT TEST REPORT. DUPONT MODEL 461 NOX ANALYZER. PERFORMANCE TEST REPORT. INITIAL TEST AND RETEST (INTERIM REPORT). *Environmental Protection Agency Contract 68-02-0240, Task 6, Rept. 73-NTA-la, 43p., Nov. 1975. (The final report bears the APTIC Accession Number 81079.)*

A continuous monitoring system for oxides of nitrogen at a nitric acid plant was tested. The test parameters were accuracy, zero drift, calibration drift, calibration error, and response time. Problems with the instrumentation were encountered during the first three days of testing. The test results are presented in two sets of data: one set using data for the entire week's testing, and the other set using only data acquired after the problems were corrected. Neither set of results met the test specifications for calibration error and calibration drift. When these parameters were retested, only 24-hr calibration drift failed to meet the test specifications. It was improved, however, from the value obtained during initial testing. Accuracy, zero drift, and response time met the test specifications in both sets of initial test data. (Author abstract modified)

60133 **APTIC NO. 81230**

Working Group for Airborne Dust Measurement (Japan), Subcommittee on Air Environment

MEASUREMENT METHODS FOR AIRBORNE DUST IN THE FIELD OF CONSTRUCTION (2). *(Kenchiku no bunya ni okeru fuyu funjin sokuteiho (2)). Text in Japanese. Kenchiku Zasshi (J. Architecture and Build. Sci.), 90(1098):849-866, Sept. 1975. 10 refs.*

Measurement methods for determination of airborne dust by entrapment of dust or by direct measurement of airborne dust concentrations are briefly surveyed. Basic principles underlying the apparatuses, their working characteristics, virtues, and limitations are summarized. The machines surveyed are: low volume air sampler; high volume air sampler; digital dust indicator; filter dust counter (optical transmittance of filter paper before and after dust collection is determined photometrically); tape air sampler; integral filter dust counter (glass fiber filter; integrating-tape photometer with automatic recorder); light-scattering type particulate counter; dust counter (Owens, 1922; modified by Ishikawa and Eda in 1935); cascade impactor, sedimentation cells; counters for airborne microorganisms (precipitation; Andersen sampler; pinhole sampler; impinger; sodium glutamate filter).

60134 **APTIC NO. 82144**

Matsushita, Hidetsuru and Keiichi Arashidani

DIMETHYL SULFOXIDE AS A SOLVENT IN A SPECTROFLUOROMETRIC DETERMINATION OF POLYNUCLEAR HYDROCARBONS. *(Takan hokozoku tanka suiso no keiko bunsekiyo yabaito shite no jimechiru suruhokishido). Text in Japanese. Bunseki Kagaku (Japan Analyst) (Tokyo), 24(3):198-200, March 1975. 6 refs.*

Dimethyl sulfoxide (DMSO) was more useful than common solvents such as benzene in the determination of polynuclear hydrocarbons (PAH) in suspended particulates, coal-tar, and petroleum. With this solvent PAH can be analyzed quantitatively with a higher sensitivity. The spectral patterns in DMSO and benzene were very similar, but the fluorescence peak wavelengths of PAH in DMSO were slightly shifted towards longer wavelength. The use of DMSO simplified the extraction

procedure of PAH from acetylated cellulose thin layer plates, because of the high dissolving power of the solvent. (Author abstract)

60135 **APTIC NO. 82647**

Coordinating Research Council, New York, Sub-Panel on Hydrocarbon Measurements

COOPERATIVE EVALUATION OF TECHNIQUES FOR MEASURING HYDROCARBONS IN DIESEL EXHAUST. PHASE IV: 1972-1973. *Proj. CAPI-1-64, Rept. 471, 36p., Nov. 1975. 2 refs.*

A cooperative evaluation of techniques for measuring hydrocarbons in diesel exhaust was conducted. A multicylinder diesel generating set was circulated among 15 participating laboratories, and each laboratory measured exhaust hydrocarbons by methods that complied with the Society of Automotive Engineers Recommended Practice J215, Continuous Hydrocarbon Analysis of Diesel Exhaust. They also measured hydrocarbon concentrations of two bottled gases having unknown compositions. Analyses were fairly consistent within laboratories both on bottled gases and engine exhaust, with standard deviations of 3 and 10% of the grand averages being recorded, respectively. However, analyses differed substantially among laboratories both on bottled gases and engine exhaust, with the standard deviations being 10 and 22%, respectively, of the grade averages. Thus, further improvement in techniques for analyzing hydrocarbons in diesel exhaust is needed. (Author summary modified)

60136 **APTIC NO. 83481**

General Inst. for Electron Technology

DIGITAL MASS SCANNING SYSTEM FOR THE MEASUREMENT OF ENVIRONMENTAL POLLUTION. SIMULTANEOUS AND CONTINUOUS MEASUREMENT OF MULTICOMPONENTS OF 10 PPB ORDER. *(Kogai keisokuyo digital shitusryo sosa system. 10 ppb no ta-seibun doji renzoku sokutei o mezashite). Text in Japanese. Jita News, vol. 1975:6-8, June 1975.*

Measurement of various pollutants with one instrument is very important from the vviewpoint of economy saving manpower. Studies were made on the application of mass spectrometry which is known for its high detection sensitivity and wide application. It was found that 0.1-1 ppm hydrogen sulfide, methyl mercaptan, and carbon disulfide could be determined without any concentration treatment. Satisfactory linear relationships held between the actual amounts and the measured amounts for 0.3-30 ppm GS2, 5-20 ppm methyl mercaptan, and 3-40 ppm H2S. A digital mass scanning system, DMSS, was designed for digital expression of the measured data. The gas that remained in a vacuum of 3 times 10 to the -7th torr was quantitatively analyzed with a mass spectrometer fixed to a scanning range of 19-26 m/e. The results are shown in both the DMSS expression and the conventional analogue expression. The former suggested that simultaneous and continuous determination of multicomponents is possible down to 0.01 ppm without concentrating treatment of sample gases.

60137 **APTIC NO. 83484**

Saitama Prefectural Environmental Pollution Research Center

ANALYTICAL METHOD OF ATMOSPHERIC AMMONIA. *(Taikichu anmonia no bunsekiho no kento). Text in Japanese. Saitama-ken Kogai Senta Nenpo (Annu. Rept. Saitama Pref. Environ. Pollut. Res. Cent.), no. 2:57-60, 1975.*

A study of improvements of the pyridine-pyrazoline (P-P) method and the results of a comparison between the improved P-P method and the indophenol method (I-F) are given. The following tests were conducted to investigate the P-P and I-F analytic methods for atmospheric ammonia: the preparation of a sulfur filtering paper for the P-P method to collect ammonia; the collection rate of the improved sulfur filtering paper and bubbler of the I-F method; a comparison between the P-P method and the I-F method. The results indicate that ammonia of 10 microgram in the background of the sulfur filtering paper of the P-P method cannot be removed, and the P-P method requires a higher rate of air flow than specified by the Environmental Agency when the concentration of atmospheric ammonia is around 1 ppm. The ammonia collection efficiency of both methods was acceptable; however, the P-P method was complicated and the I-F method measured relatively lower than the P-P method. Double checking the measurements or jointly using the P-P and I-F methods are suggested.

60138 **APTIC NO. 83570**

SMOKE READINGS VARY WITH OBSERVERS. *Electrical World, vol. 1975:57-59, Jan. 15, 1975.*

The accuracy of smoke density and opacity observations measured with the Ringelmann chart was tested using seven certified observers. All observers, using the unaided eye method, made concurrent smoke density estimates on signal at 30-second intervals, for a total of 60 reading periods. During the test, each observer estimated the density of black smoke plumes from the stacks on an incinerator, an industrial power generation facility, a coke plant, and from a smoke generator. The observers were able to make accurate readings, although some observers regularly assigned darker and others lighter values to the same smoke plume. A significant bias was found for readings darker than 3.25 RN. Smoke readings by a single observer are not precise enough to provide very good control of visible emissions. Single readings are not very reliable for enforcement purposes when regulatory controls are strict.

60139 **APTIC NO. 83700**

AIR POLLUTION MONITORING NETWORKS. *(Resaux de mesure de la pollution). Text in French. Inform. Chim., no. 148:161-162, 165-169, Oct. 1975.*

Specific analyzers to complete acidity monitoring networks are described. The SERES 573 analyzer measures sulfur compounds. Maintenance of acidity monitors is low-cost since they need to be checked only every 4-5 weeks, due to reliable electronics and a distilled water reservoir of adequate capacity. The average time between breakdowns in 20 months. The SERES 573 works with flame photometry, the most advantageous method to date. The chemiluminescent reaction produces a number of emission lines between 350 and 450 nm; to reduce the interference of other reaction emission lines, only the line nearest 394 nm is used. A circular monochromator is used which has two 394 nm filters and two 400 nm filters. To achieve specific and selective measurement of the various sulfur compounds column chromatography is necessary to separate the different compounds. Specialized telephony is the simplest and most reliable way of transmitting information. It includes three systems, the PCM or modulation by coded impulses, the ASK or amplitude displacement system, and the FSK or frequency modulator system. Centralization and handling of the data can be organized by cabled logic or by mini-ordinator based on programmed micro-processors. The latter is gradually replacing the former because of competitive prices, easily managed and modifiable systems, facile automatic calibration, and great potential for calculations at real time.

60140 **APTIC NO. 83827**

A LIST OF NOX AUTOMATED MONITORING DEVICES EFFICIENCY FOR STATIONARY SOURCES. *(Kotei hasseigen yo NOx jido sokuteisochi ichiran). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(12):50-56, Dec. 1975.*

A table is given which lists performance of nitrogen oxides automatic analyzers for nitrogen oxides discharged from stationary sources. According to the list the highest priced NOx analyzer costs $10,000. This unit, the Mitsubishi Electric Machine, model SA-401, uses an ultraviolet ray absorption method with a sample inflow velocity of 3/l min and a response speed of the analyzer and the sampler designed for 60 sec and 90 sec, respectively. This NOx analyzer can measure nitric oxide, NOx, and nitrogen dioxide in the range of 0-50, 0-100, 0-200, 0-500 and 0-1000 ppm without using a converter, and is equipped with an oxygen analyzer and a telemeter senser for surveillance of smoke stacks. The lowest priced NOx analyzer is Koritsu Machinery s model SUS-27 which costs $2800. This analyzer employs a low potential electrolytic method, and is provided with a sample inflow velocity of 0.5 l/min and a capability to measure NOx (NO + NO2) in the range of 0-100, 0-300 and 0-1000 ppm. The response speed of this analyzer and the sampler is 30 and 60 sec, respectively. This unit is a portable instrument and has an oxygen analyzer and a sulfur dioxide analyzer as subsidiary instruments.

60141 **APTIC NO. 83837**

MEASURING AND EXPERIMENT OF MIST. *(Misuto no sokutei, jikken). Text in Japanese. MOL., 13(13):50-53, Dec. 1975.*

Mist measuring tests were conducted by the Japanese Society of Industrial Machine Industry in 1974 for measuring water mist, sulfur mist and alkali mist. The object of the tests was to establish an inspection standard for the qualification test of mist removal devices. The amount of mist generated and the particle size of mist were measured. The mist is sampled from a test water mist generation plant, a gas cooling and cleaning column of a sulfur processing plant, and a lime-gypsum method stack gas desulfurization facility. The results of the water mist test indicate difficulty in measuring the water content of the mist using any method, and the size of the majority of mists range from 0.5-2 micron. The sulfur mist measuring test revealed that the model EP method alone produced a different measured value of sulfur mist than other methods. The alkali mist measuring test showed that all the measuring methods produced the same or almost the same measurements.

60142 **APTIC NO. 83995**

Satorius Membranfilter, Goettingen (West Germany)

DUST MEASUREMENT OF UNITS FOR THE WORKING PLACE, FOR THE EVALUATION OF EMISSIONS AND IMMISSIONS. *(Staubmessgeraete im Bereich der Arbeitsplatz-, Emissions- und Immissionsbewertung). Text in German. Preprint, 4p., 1975.*

General principles of gas sampling and dust concentration measurements at emission sources, in workplace air, and in the atmosphere in general are discussed. Gravimetric, volumetric, light scattering and beta-absorption methods are increasingly used in dust concentration measurement. The beta-absorption technique permits automatic and continuous or semicontinuous monitoring. Dust sampling for concentration measurement at workplaces should be done in accordance with the specifications of the Johannesburg Convention. The suction rate should be 1.25 m/sec. Isokinetic sampling is necessary for dust concentration measurements at emission sources and in the atmosphere. Volumetric instruments with recording units are used preferably for emission measurement.

60143 **APTIC NO. 84185**

MEASUREMENT OF GASEOUS AND SOLID AIR POLLUTANTS. *(Il controllo degli inquinamenti atmosferici gassosi e solidi). Text in Italian. Inquinamento, 17(2):38-40, Feb. 1975.*

The model FIG-1 for the determination of gaseous air pollutants automatically collects air samples with the simultaneous determination of the volume of the air sample. The air flow passes through an absorber which contains absorbent reagents; along with the colorimetric and spectrophotometric analyses, make possible the quantitative determination of the pollutants. The duration of sampling is adjustable from 0 to 24 hr and the air flow from 0.1 to 4 l/min under normal operating conditions. The automatic sequential and continuous model DP-12 collects 12 air samples and determines gaseous air pollutants. It is identical to the PIG-1 as far as the collection system is concerned, but does not have a volume meter. Speed of collection and time intervals are adjustable. This allows supervision of pollutant concentration formation for a time period between 6 hr and 12 days at regular intervals between 0 and 24 hr; air flow is controllable from 0.1 to 4 l/min. The model PP-1 collects samples of inert dust particles suspended in the air and determines particulate pollutants. It functions like the previously described models. Suspended particles are held back by a membrane filter with micropores. Concentration is determined by gravimetry. Sample collection is adjustable from 0 to 24 hr, and the air flow is fixed at 30 l/min. The model PP-12 which determines particulate air pollutants, is similar to the PP-1 as far as the collection system is concerned, but it does not have a volume meter which can be acquired as an accessory. Concentration formation proceeds for a period of time adjustable between 6 hr and 12 days, at regular intervals adjustable between 0 and 24 hr; the air flow can range from 3 to 30 l/min. Accessories are listed for all models.

60144 **APTIC NO. 84660**

Japan Environmental Agency

GUIDELINE ON MEASUREMENT METHODS OF ENVIRONMENTAL ATMOSPHERE. *(Kankyo taiki chosa soutei hohoto shishin). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 10(4): 33-53, July 1975.*

A revised edition of the Guideline on measurement methods of environmental atmosphere was published in 1973. The 1974 edition gives improved methods based on further experience. The committee to investigate measurement methods was established at the Environmental Protection Agency. Efforts have been made to unify analytical methods, but no completely satisfactory result has been reached. Therefore, at some research institutes which have had extensive experience in analysis, if it is not necessary to conform to the unified measurement methods described here. Methods, frequency, and period of sampling referred to are also only general standards, to be revised in accordance with the anticipated concentration in the atmosphere. The pollutants covered are sulfur dioxide, carbon monoxide, hydrocarbon, oxidant, ozone, dust, aerosol, fluorine (gaseous and particulates), nitrogen oxides, gaseous halogens, ammonia, mercury, cyanides, polychlorinated biphenyls, benzopyrene, hydrogen sulfide), and soot. General rules for measurement are also given. Reagents used must be better than Japanese Industrial Standard special class quality. Air volume is based upon 20 C. The error of flowmeters is around 2%.

1974

60145 **APTIC NO. 76028**

Aleksandrov, N. N., G. S. Guniya, A. I. Gunchenko, and Y. I. Turkin

METHODS OF SPECTRAL ANALYSIS FOR DETERMINATION OF CHEMICAL COMPOSITION OF ATMOSPHERIC POLLUTANTS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 6 refs. Translated from Russian, 11p.*

A method of direct spectral analysis of microimpurities in single samples of atmospheric dust is described. The technique has a sensitivity of 2 times 10 to the minus 9th power to 1 times 10 to the minus 6th power per 2 mg of sample. The method takes into account the background metallic pollutants contained in the filter itself, a necessity because of the small size of the samples. The variable and complex composition of macrocomponents in atmospheric dust hinders measurement of microimpurities. This method transforms the samples to a form suitable for microanalysis, allowing the simultaneous determination of up to 14 elements in one-time samples. The sample is evaporated and excited from the channel of a carbon electrode in an alternating current arc.

60146 **APTIC NO. 79881**

Bailey, Adrian G.

THE GENERATION AND MEASUREMENT OF AEROSOLS. *J. Mater. Sci., no. 9:1344-1362, 1974. 61 refs.*

A review of methods for the generation and measurement of aerosols is presented. Topics discussed include: aerosol formation by physical dispersion or condensation; aerosol characterization by micro-photography, holographic techniques, light scattering and extinction measurements, and the use of laser Doppler spectroscopy; and representative aerosol sampling. Problems involved with perturbing the size distribution of aerosols during sampling are also outlined along with difficulties in producing standard aerosols.

60147 **APTIC NO. 83592**

Baker, Bertsil B., Jr.

MEASURING TRACE IMPURITIES IN AIR BY INFRARED SPECTROSCOPY AT 20 METERS PATH AND 10 ATMOSPHERES PRESSURE. *Am. Ind. Hyg. Assoc. J., 35(11):735-740, Nov. 1974. (Presented at the American Industrial Hygiene Conference, Minneapolis, Minn., June 1-6, 1975.)*

The measurement of trace impurities in air by infrared spectroscopy at 20 meters path and 10 atmospheres pressure is described. The use of a new type of drying device achieves considerable selectivity in the removal of water from ambient air. The sample is compressed to 10 atm, without the separation of liquid water that would otherwise occur. Use of the higher pressure in a 20 meter gas cell permits the infrared spectral detection of many compounds of toxicological interest in the 0.05 to 1 ppm range. These include the air pollutants carbon monoxide, sulfur dioxide, hydrogen sulfide, and carbon disulfide, and classes of pollutants such as chlorinated hydrocarbons, fluorinated hydrocarbons, acid fluorides, esters, aldehydes, ethers, ketones, nitriles, amines alcohols, and acids.

60148 **APTIC NO. 84326**

Blosser, Russell O. and Isaiah Gellman

CURRENT APPROACHES TO MEASUREMENT OF PARTICULATE EMISSIONS FROM WOOD PULPING OPERATIONS. *AIChE Symp. Ser., 70(137):294-298, 1974. 3 refs.*

Factors affecting the sampling of particulates from kraft pulping operations are reviewed. Sulfur dioxide, which may be present in particulate-laden off gas, is capable of reacting with particles when impingers are used in the sampling train, resulting in the measurement of material which does not exist as particulate matter at stack conditions. Material trapped in impingers is equivalent in weight to that captured on 0.3 micron glass fiber filters on sources low in SO2, however, illustrating that source particulate sampling procedures which are simpler than those using the Environmental Protection Agency sampling train are suitable if SO2 and condensible compounds are essentially absent in the source. Optical particle counters can be used for continuous source monitoring and offer the advantage of providing a particle count for selected size ranges. (Author abstract modified)

60149 **APTIC NO. 83611**

Boubel, Richard W.

METHOD AND APPARATUS FOR MEASURING PARTICULATE EMISSIONS IN GAS FLOW. *(Rader Companies, Inc., Portland, Oreg.) U. S. Pat. 3,841,145. 6p., Oct. 15, 1974. 20 refs. (Appl. Aug. 3, 1973, 2 claims).*

A stack sampler for collecting particulates in gaseous emissions is described. It includes means to match the volume rate of flow through the sampler to the flow in the stack. A removable filter is located in the sampler and is adapted to collect particulate matter from the gaseous emission during the isokinetic flow. The high volume capacity of the sampler permits accurate samples to be obtained during short sampling periods. This is an improvement over other filter samplers which require a long sampling period. (Author abstract modified)

60150 **APTIC NO. 76042**

Bourbon, P., J. Alary, J. F. Eclassan, and F. Alengrin

ON THE DETERMINATION OF NO2 AND HNO2 IN THE ATMOSPHERE. *(Sur la determination de NO2 et NO2H dans l atmosphere). Pollut. Atmos. (Paris), 16(61):39-42, Jan.-March 1974. 4 refs. Translated from French, 12p.*

A method of difference for evaluating atmospheric nitrogen dioxide and nitrous acid, based on the elimination of NO2H by sulfamic acid according to the equation HNO2 + sulfur dioxide yields the intermediates OH + NH3 yields sulfuric acid + gaseous nitrogen + water is proposed. The expected concentration of HNO2, calculated from reaction rates for typical atmospheric concentrations of nitric oxide, NO2, and nitrogen trioxide, is very slight. The proposed technique is applicable provided that HNO2 represents at least 5% of the NO2. This value limit is fixed by a very weak retention of NO2 in the filter used. A dry carrier (a filter impregnated with sulfamic acid solution) enhanced sensitivity and precision of the technique when used in place of aqueous sulfamic acid. Saltzman reagent is used.

60151 **APTIC NO. 71859**

Bromberg, Steven M., Berne I. Bennett, and Gerald G. Akland

SURVEY OF SYSTEM PERFORMANCE ANALYSIS OF SIMULATED AMBIENT CARBON MONOXIDE SAMPLES (SURVEY NO. 2). *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Quality Assurance and Environmental Monitoring Lab., 22p., Aug. 1974. 5 refs.*

A second interlaboratory performance survey was made of systems sampling for carbon monoxide. The test materials were mixtures of CO, carbon dioxide, methane, and dry air. Three concentrations of CO were sent to each participant. Any method of analysis was acceptable provided the procedure was used routinely by the participating agency. Tolerance limits based on sample variability and between instrument variability were used. Sixteen percent of the intruments accounted for 52% of the unacceptable results. The percentage of instruments able to analyze all three samples increased from 47% in the first survey to 55% and the percentage of instruments that missed three samples changes from 2% to 3% The generally good agreement with the target values indicate that most instruments can satisfactorily assay CO in air within the range of the samples provided.

60152 **APTIC NO. 84341**

Byers, R. L., J. W. Davis, W. L. Matson, and H. A. Mckinstry

PARTICLE SIZE AND SHAPE CHARACTERIZATION BY SCANNING ELECTRON MICROSCOPE. *AIChE Symp. Ser., 70(137):322-326, 1974. 11 refs.*

The use of scanning electron microscopy for particle size and shape characterization is discussed. Scanning electron microscope images processed by digital computer are capable of producing reliable size measurements of nonvolatile particulates as well as a contour analysis for each individual particle. An ellipse of best fit calculated on each particle permits the determination of an aspect ratio which is a measure of the particle shape. Presently, the resolution of the method does not permit for the routine processing of particles smaller than about 0.1 micron. Measurements for atmospheric dusts are presented to illustrate the type of measurements which can be made on industrial process dusts. (Author abstract modified)

60153 **APTIC NO. 79064**

Cahill, T. A., R. G. Flocchini, R. A. Eldred, P. J. Feeney, S. Lange, D. Shadoan, and G. Wolfe

USE OF ION BEAMS FOR MONITORING CALIFORNIA S AEROSOLS. *National Science Foundation, Washington, D. C., Research Applied to National Needs, Trace Contam. Conf. Proc. 2nd Annu., Pacific Grove, Calif., 1974, p. 133-134. (Aug. 29-31.)*

NTIS: LBL-3217

Sampling and analytical techniques employed in the State of California s Air Resources Board Aerosol monitoring program are described. Particle sizing is accomplished with two-stage Lundgren impactors with after filters. Normally, 24-hour samples are taken in the size ranges of 0.1-0.5 micron, 0.5-5 micron, and 5-20 micron (effective aerosol diameter at unit density). Trace analyses are performed with an ion-excited X-ray technique involving the elastic scattering of alpha particles. Approximately 1000 analyses required each month are being completed during a single day.

60154 **APTIC NO. 81964**

Carpenter, B. Stephen and G. Michael Reimer

FISSION TRACK TECHNIQUE FOR URANIUM DETERMINATION IN COAL AND FLY ASH STANDARD REFERENCE MATERIALS. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 141-143. 2 refs. (July 29-31.)*

NTIS: CONF-740701

A fission track technique for the determination of uranium in coal and fly ash is described. The samples are compared directly with standard reference material elemental compositions for coal and fly ash. The total thermal neutron dose is selected to provide a track density convenient for counting. The range of the fission fragment is typically on the order of 0.001 cm so that counting tracks over an area of 1 sq cm, assuming a density of 2, means that only 2 mg of the sample is actually involved in the analysis. The need to determine most experimental parameters is eliminated by using the comparative technique involving standard reference materials, the uranium contents being proportional to the track counts. The single parameter that must be determined is the density of the unknown and standard since the range of the fission fragment is related to the density.

60155 **APTIC NO. 75980**

Constant, Paul C., Jr. and Michael C. Sharp

COLLABORATIVE STUDY OF METHOD 104 - REFERENCE METHOD FOR DETERMINATION OF BERYLLIUM EMISSION FROM STATIONARY SOURCES. *Midwest Research Inst., Kansas City, Mo., Environmental Protection Agency Contract 68-02-1098, Program Element 1HA327, ROAP 26AAG, Rept. EPA-650/4-023, 97p., June 1974. 2 refs.*

NTIS: PB 245011/AS

A collaborative test of the Environmental Protection Agency Method 104 for the determination of beryllium emissions from stationary sources was conducted at the Coors Porcelain Company in Golden, Colorado during the period December 4-21, 1973. The test comprised 13 runs, each on a different day. Simultaneous samples were obtained by four different collaborative organizations over the same 30 point traverse in the stack, with each point being sampled for 8 min by each collaborator. The collaborators also analyzed simulated standard samples prepared by the National Bureau of Standards. The collaborator- to-collaborator variability (38% coefficient of variation) and the measurement variability (44% coefficient of variation) were approximately the same and relatively large. The daily fluctuation in beryllium emission rate at the sampling was very large (0.25-2.7 g/day) compared to observational errors. The collaborators did not differ significantly in the amount of beryllium collected per run on their filters. Almost all of the differences in the collaborators determinations of the amounts of beryllium collected during a run were due to the differences in the wash portion of the samples. A profile plotted from the average determinations of the four collaborators correctly represented the geometrical variances in velocity throughout a run. (Author summary modified)

60156 **APTIC NO. 70535**

Cooper, Hal B., Jr., Gary D. Rawlings, and Robert S. Foote

MEASUREMENT OF MERCURY VAPOR CONCENTRATIONS IN URBAN ATMOSPHERES. *ISA (Instr. Soc. Am.) Trans., 13(4):296-302, 1974. 17 refs. (Presented at the Instrumentation Society of America Conference and Exhibit, Annual, 28th, Houston, Tex., Oct. 15-18, 1973.)*

Ambient mercury concentrations in urban atmospheres in Dallas, Texas, were determined by collection of the vapor by amalgam formation on a gold screen for individual samples. Mercury vapor was released from the amalgam by heating of the gold screen, followed by analysis with a flameless ultraviolet double beam atomic absorption spectrophotometer. The technique was also suitable for source gas emission measurements by means of appropriate dilution and cooling with air. Ambient mercury vapor concentrations at a location adjacent to a freeway correlated with traffic volume. Ambient mercury vapor levels varied between 4 and 40 nanograms/cu m. Rainfall near an airport removed mercury from the upper air at a peak traffic period and reemitted it at the ground level during periods of intense rainfall activity. Elevated mercury vapor levels were observed near nonferrous metal smelters, a Kraft pulp mill, and a chlor-alkali plant. Ambient mercury levels at locations along a ship channel varied between 4.07 and 9.13 ng/cu m, except at two locations downwind of a specific point source. Mercury vapor concentrations downwind from the chlor-alkali plant were 20.75 and 26.60 ng/cu m. Mercury concentrations downwind from a complex of two Kraft pulp mills and downwind from a copper smelter were 40 and 30 ng/cu m, respectively. (Author abstract modified)

60157 **APTIC NO. 84338**

Coughlin, Robert W.

PHYSICOCHEMICAL ASPECTS OF SAMPLING PARTICULATES. *AICHE Symp. Ser., 70(137):273-276, 1974. 1 ref.*

The chemical and physical ramifications of different definitions of particulate matter and of different sampling techniques are examined from the standpoint of a three-phase system containing solids, liquid, and gas. Physicochemical processes involving adsorption, condensation plus nucleation, adsorption plus chemical reaction (catalysis), coagulation, and capillary condensation are reviewed. Arrangements of different sampling trains are described to illustrate the importance of the location of particulate collection relative to gaseous collection and water condensation in the train.

60158 **APTIC NO. 80222**

Derr, V. E., M. J. Post, R. L. Schwiesow, R. F. Calfee, and G. T. McNice

A THEORETICAL ANALYSIS OF THE INFORMATION CONTENT OF LIDAR ATMOSPHERIC RETURNS. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., Rept. ERL 296-WPL 29, 284p., Nov. 1974. 144 refs.*

The applicability of lasers to observation of the atmosphere is discussed. The discussion of interaction with atmospheric constituents includes scattering from atmospheric particulates. The LIDAR techniques are described. Measurement of

weather conditions, the obstruction of visibility, and atmospheric gas concentrations is discussed. Decision algorithms are included. Application of LASER techniques to unmanned automated weather stations is discussed.

60159 **APTIC NO. 79278**

Dolan, William P.

ODOR PANELS. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 5, p. 75-82. 6 refs.*

The use of odor panels for the quantification of odorous air pollutants is discussed, with particular reference to the American Society for Testing and Materials dilution method. Panel members are exposed to various dilutions of the odorous compound and are required to response positively or negatively to the presence of an odor. The dilution factor is noted and the percent of panel members detecting an odor computed. An odor response chart is constructed with this information using semilogarithmic paper since the data generally tend to follow a straight line. The line is drawn showing the average of the points. The intersection of the 50% panel response line is the threshold odor concentration. This information can then be used to compute the odor emission rate.

60160 **APTIC NO. 79811**

Dowd, G. and L. Dubois

SOURCE CHARACTERIZATION OF SWITCHING TRANSIENTS AFFECTING INSTRUMENTATION FOR CHEMICAL ANALYSIS. *Sci. Total Environ., vol. 3:179-203, 1974.*

The identification of the source conditions of two representative transients commonly present in and mixed with the output data from air pollution measurement instrumentation is reported. The first transient analyzed is a pulse type associated with interference from triac switching. Its component angular velocity is such that voltages are transferred, almost unattenuated, through differential systems. It acts as a low impedance high energy source in this condition. The second transient analyzed is a sinusoidal wave type, often found as alternating current pickup in high impedance circuits. Once captured in a ground loop, it is extremely difficult to remove. A complete characterization of these conditions is given, describing direct methods for shielding, filtering, and offsetting their effects. (Author abstract modified)

60161 **APTIC NO. 79276**

Dravnieks, Andrew

THRESHOLD OF SMELL AND MEASUREMENT. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 2, p. 27-44.*

Analytical and sensory method of odor detection and measurement are reviewed. Topics discussed include: the use of gas chromatographic techniques for the simultaneous analysis of several odorants, combination analytical/sensory approaches to odor measurement, the use of odor panels for the sensory evaluation of odors, and specific measurements of odor threshold, intensity, acceptability, and quality. Most odor regulations are based on odor detectability, while some are based on acceptability. Instrumentally, odor detectability measurements are made with two types of sample dilution techniques. Static dilution measurements involve diluting a known volume of odorous sample by the addition of a known amount of nonodorous air. In dynamic dilution measurements, the sample flows into some mixing volume at a constant rate, mixes with dilution air, and is continuously available for smelling.

60162 **APTIC NO. 80019**

Dreuw, Heinz, Hans-Jurgen Mischke, Franz Lippeck, Gitia Bohnenkamp, and Marion Lippeck

APPARATUS FOR MONITORING AND TAKING GAS SAMPLES IN SHAFT FURNACES. *(Fried Krupp GmbH, Essen (West Germany)) U. S. Pat. 3,832,904. 4p., Sept. 3, 1974. 2 refs. (Appl. March 14, 1973, 6 claims).*

An apparatus for monitoring and taking gas samples in shaft furnaces is described. This apparatus includes a gastight housing sealingly connected to the wall of a furnace and carrying within it a horizontally disposed probe mounted for reciprocal movement through the wall. The measurements and samples are withdrawn from the housing through a sealed passage. The movement of the probe is controlled by a drive device disposed outside the housing and communicating with the probe mount through sealed passages in the housing. Unlike other devices which can take samples only at long intervals because extreme stress from heat and pressure, this apparatus can take samples at relatively short intervals because of the gastight housing sealing. (Author abstract modified)

60163 **APTIC NO. 68126**

Druyan, Y. A.

SEPARATE DETERMINATION OF PHENOL AND ORTHO-, META- AND PARA- CRESOLS IN THE AIR BY THIN-LAYER CHROMATOGRAPHY. *(Razdelnoye opredeleniye fenola i orto-, meta- i para-krezola v vozdukhe pri pomoshchi tonkosloynoy khromatografii). Text in Russian. Gigiena i Sanit., no. 8:51-53, 1974. 1 ref.*

Combined thin-layer chromatographic and photometric methods for the detection and quantitative determination of phenol and ortho-, para- and meta-cresols in their mixtures as occur in the air in spaces where phenol-formaldehyde-based polymers are stored is described. An air sample of 1-2 liters is taken at a rate of 0.5 l/min through an absorber with sodium hydroxide. The sample is combined with para-nitrophenyldiazonium and 10% sodium hydroxide solution to obtain azo compounds of phenol and the cresol isomers, after which the mixture is separated on a chromatographic layer using 10:1.5:1 ratio of benzene, methanol, and diethylamine as solvent system. The Rf values of phenol, meta-cresol, ortho-cresol and para-cresol were 0.20-0.24, 0.26-0.30, 0.33-0.44, and 0.95-0.96, respectively. Quantitative determination is possible either by visual comparison with a standard scale or by photometric methods following elution, using the wavelengths of 400 nanometers for phenol, 515 nanometers for ortho- and meta-cresol, and 540 nanometers for para-cresol. The sensitivity of the method amounts to 0.1 microgram in the eluate. The minimum detectable quantities on the chromatogram are 0.005 microgram for phenol, ortho-, and meta-cresol, and 0.03 microgram for para-cresol.

60164 **APTIC NO. 83585**

Dworetsky, Samuel H.

FEASIBILITY OF AUTOMATIC ISOKINETIC STACK SAMPLER. *Environ. Sci. Technol., 8(5):464, May 1974.*

A method for the isokinetic sampling of emissions from stack sources is discussed. The technique takes advantage of the pressure developed by a passing flow of gas, as described by Bernoulli s equation. An arrangement of two capacitors with a common pliable element is used as a pressure transducer to compare the probe and stack velocities. An electrical feedback circuit varies the probe flow motor, such that the pressure difference is zeroed, ensuring the equality of the flow rates. Monitoring the speed of the probe motor gives a continuous record of the stack velocity at the point being sampled.

60165 **APTIC NO. 79614**

Fantuzzi, A., G. Consonni, and G. Locati

METHOD FOR MEASURING ISOCYANATES IN AMBIENT AIR. *(Messa a punto di una metodica per la determinazione degli isocianati). Text in Italian. Med. Lavoro (Milan), 65(5-6):188-192, 1974. 2 refs.*

A method is presented for the measurement of toluene diisocyanate and diphenylmethane diisocyanate in the air. This method has a high sensitivity that renders it reliable for the determination of these two isocyanates in the working environment. Compared with other methods, which are equally reliable but which require the use of sophisticated and complicated equipment, this method can be used even in laboratories equipped with only simple basic instruments. (Author abstract)

60166 **APTIC NO. 70586**

Fernandez, C.

A MICRO/MACROTECHNIQUE FOR THE EVALUATION OF IRONFOUNDRY DUST SAMPLES. *Ann. Occupational Hyg., 17(2):97-109, 1974. 21 refs.*

A technique for the assessment of silicosis dust hazard in iron foundry dust is described. Two types of sampling instruments are used: a personal size selecting gravimeter dust sampler and a hexhlet sampler with an adaptor to take a 5.5 cm diameter filter. Gravimetric measurements are performed on a balance, and quartz is determined by infrared spectrophotometry. The procedure is based on the elimination of the filter by dissolution, centrifuging, and successive washes such that total recovery, gravimetric measurements, incineration, and further total recovery, if necessary, can be completed in a single container (a pyrex glass tube). Microsorban is the filter material of choice. The technique allows for the estimation of total respirable dust concentration, incinerated respirable dust concentration, and quartz content as a percent of total respirable dust. Total respirable dust concentration is deduced from the filtered air volume and the weight of the sample, while incinerated respirable dust concentration is calculated from the weight of incombustible dust and the volume of filtered air. The infrared technique is capable of detecting about 1% of quartz in an ashed sample weighing 0.40 mg. Common interferences include iron oxide and aluminum oxide. However, reasonably good agreement between quartz content and analytical results can be obtained by using the transmission measured to the peak of the transmission curve immediately before the quartz 12.5 micron absorption. Application of the method to an iron foundry (150 personal samples and 80 static (hexhlet) samples) indicates that the most hazardous working sites are: sand preparation, sandblasting and grinding, moulding and knocking out, and pouring and loading of blast furnaces.

60167 **APTIC NO. 81776**

Filby, R. H. and K. R. Shah

ACTIVATION ANALYSIS AND APPLICATIONS TO ENVIRONMENTAL RESEARCH. *Toxicol. Environ. Chem. Rev., vol. 2:1-44, 1974. 170 refs.*

Principles and applications of neutron activation analysis are reviewed. Thermal and first neutron activation analysis using nuclear reactors, accelerators, and californium-252 sources are discussed; and recent developments in gamma-ray spectrometry (germanium-lithium detectors, anticoincidence shielded Ge-Li detectors, and multidimensional sodium iodide-thallium spectrometers) are outlined. Accuracy, precision, sources of error, and interferences are also considered. Neutron activation analysis is particularly suited for the trace analysis of airborne particulates because of the method s high sensitivity, the possibility of measuring many elements in a single sample, and the non-destructive nature of the method.

60168 **APTIC NO. 81797**

Foster, J. F., G. H. Beatty, and J. E. Howes, Jr.

INTERLABORATORY COOPERATIVE STUDY OF THE PRECISION AND ACCURACY OF THE MEASUREMENT OF LEAD IN THE ATMOSPHERE USING THE COLORIMETRIC DITHIZONE PROCEDURE. *Battelle Memorial Inst., American Society for Testing and Materials Data Series Publication DS55-S5, 84p., 1974 (?). 11 refs.*

The results obtained from an interlaboratory cooperative study of the precision and accuracy of the colorimetric determination of airborne particulate and vaporous lead using the dithizone procedure as described in the American Society for Testing and Materials Method D-3112 are presented. A statistical analysis of 126 particulate lead determinations performed at three different test sites resulted in between-laboratory coefficients of variation ranging from 11-13% and within-laboratory coefficients of variation ranging from 5-10%. Between-laboratory and within-laboratory coefficients of variation for vaporous lead were 41 and 20%, respectively. (Author summary modified)

60169 **APTIC NO. 76216**

Gehrke, R. J. and R. C. Davies

X-RAY: AN ON-LINE PROGRAM FOR AUTOMATIC ELECTRON MICROANALYSIS OF OXIDES AND SILICATES USING A SI(LI) SPECTROMETER. *Aerojet Nuclear Co., Idaho Falls, Idaho, National Reactor Testing Station, Atomic Energy Commission Contract AT(10-1)-1375, 85p., March 1974. 19 refs.*

NTIS: ANCR-1133

X-RAY is an online, FORTRAN program for the automatic electron micro-analysis of silicates and oxides. Energy dispersive X-ray data are acquired with a Si(Li) spectrometer mounted on a scanning electron microscope or an electron microprobe. The data are transferred from the acquisition instrument to the computer for online processing or are stored on paper tape or magnetic tape for later batch processing. The program automatically locates the X-ray peaks in a spectrum, determines the elements associated with the X-ray peaks and calculates their relative abundances through a least squares fit of the spectrum with spectra of element oxide standards. The component spectra are obtained from the electron excitation of simple oxide standards whenever possible or from multi-element oxide or silicate standards. The contributions of each component spectrum are expressed as ratios of composite to component spectrum. Finally, the ratios are corrected for matrix effects to yield the percent concentration of each element oxide in the sample. (Author abstract)

60170 **APTIC NO. 83685**

Gentilizza, Mirjana

REVIEW OF METHODS FOR THE DETERMINATION OF SULFUR DIOXIDE IN THE ATMOSPHERE. *(Prikaz metoda za odredivanje sumporova dioksida u atmosferi). Text in Serbo-Croatian. Arhiv. Hig. Rada. Toksikol. (Yugoslavia), 25(4):435-451, 1974. 82 refs.*

The older and newer methods reviewed fall into 4 basic groups, based on: (1) determination of sulfate arising on oxidation; (2) sulfite determination; (3) direct determination of gaseous sulfur dioxide; and (4) other (silica gel, ferriphenanthroline, and polarographic methods). Selection of appropriate methods is rendered difficult by their non-specific nature, most of them being based on common characteristics (e.g., acidity, conductivity) exhibited by other air pollutants as well. It is also difficult to compare the results of the various methods, as each is subject to different interferences. Of the 20 methods described, those most frequently employed include: the acidimetric method (sensitivity: 0.01-10 ppm), which, though non-specific for sulfur dioxide (its results being affected by other alkaline and acid substances), is simple, rapid, and very cheap, and hence very suitable for field measurements; the sulfate (thorium) method (sensitivity: about 10 microgram/sample), which, though more specific, is quite expensive and more difficult; the pararosaline hydrochloride method (sensitivity: 0.005-5 ppm), which is highly suitable for laboratory experiments, but unsatisfactory for the determination of 24-hour concentrations of sulfur dioxide in the atmosphere; and the gas chromatographic, coulometric, and hydrogen flame emission spectrophotometry methods, which are all highly sensitive, but are not suitable for large-scale field studies, because of the costly instrumentation required.

60171 **APTIC NO. 84138**

Giaume, L. and G. Padoa

INSTRUMENTAL METHODS FOR THE DETECTION OF AIR POLLUTANTS. *(Rassegna di metodi strumentali per la rivelazione di inquinanti dell aria). Text in Italian. Riv. Combust., 28(7-8):271-284, June-Aug. 1974. 23 refs.*

Infrared spectrophotometry detects mainly carbon monoxide, carbon dioxide, sulfur dioxide, nitric oxide, low molecular weight hydrocarbons, and volatile solvents; it consists of an infrared source, a rotating interruptor, a cell for the samples, a reference cell, a detector-monochromator, and an indication-registration complex. The ultraviolet spectrophotometer detects nitrogen dioxide, ozone, and some aromatic hydrocarbons; it consists of a UV source, a reference cell, an analysis cell, a phototube detector, an amplification and demodulation system, and an indication-registration complex. Spectrofluorometry is used to analyze polycondensated aromatic hydrocarbons and sulfur dioxide; it consists of an irradiation source, a monochromator, a phototube for the fluorescent light, and an indication- registration complex. Atomic absorption spectrophotometry detects metals in aerosols and dusts, and also lead in benzene; it consists of a sampling system, a lamp with cable cathode, an atomization system, a monochromator, a photodetector, and a detection-registration system. Gas chromatography is used to detect mainly nitric oxide, nitrogen dioxide, carbon monoxide, carbon dioxide, sulfur dioxide, and all hydrocarbons and solvents; it works on the principle of distilled fractionation; it consists of a sampling system, a system to introduce the transport gas, a separation column, a temperature regulator, a detector, and a recorder. Chemiluminescence is used to detect nitric oxide and carbon monoxide. Coulometry detects ozone, nitrogen dioxide, sulfur dioxide, and chlorine; it is based on the chemical reaction of the gases with bromide, or sodium or potassium iodide in a slightly acidic solution; it consists of a container in which two platinum electrodes are immersed; a slight potential difference is applied, attracting the reagent ions and polarizing them. Colorimetry is mainly used to detect nitrogen oxides, sulfur dioxide, and ozone; it is based on the measure of the intensity of the color formed by the reaction of the gases with the appropriate chemical reactants. Polarography detects nitric oxide and nitrogen dioxide; it works on the principle of applying to the solution a variable potential difference; the various ions move toward the electrodes which have their characteristic tension.

60172 **APTIC NO. 83424**

Girard, Andre

DETERMINATION OF MINOR STRATOSPHERIC CONSTITUENTS IN THE PPB RANGE BY ABSORPTION SPECTROMETRY. *(Dosage des constituants stratospheriques minoritaires, de l ordre de 1 ppb, par spectrometrie d adsorption). Text in French. Acta Astronaut., vol. 1:237-248, 1974. 8 refs.*

The presence of nitric oxide has recently been detected in the stratosphere by two methods: chemiluminescence and absorption spectrometry, using the sun as a source. The spectrometric method consists essentially of an infrared spectrometer combined with a heliostat. Experimentals are being done on the use of a grid spectrometer which has a resolution limit of 0.1/cm, which is close to the theoretical limit of 0.3 cm. High luminosity is also maintained. Nitric oxide was determined by airplane and by stratospheric balloon. Nitrogen dioxide, nitric acid, ozone, and carbon dioxide were also studied at the same time.

60173 **APTIC NO. 79835**

Gomenyuk, A. S., V. P. Zharov, D. D. Ogurok, E. A. Ryabov, O. A. Tumanov, and V. O. Shaydurov

OPTICAL - ACOUSTIC DETECTION OF SMALL CONCENTRATIONS OF HYDROGEN FLUORIDE, NITRIC OXIDE AND CARBON DIOXIDE MOLECULES IN GASES BY IRRADIATION WITH HYDROGEN FLUORIDE PULSED LASER. *(Optiko- akusticheskie detektirovanie malikh kontcentrtcy molekul ftoristogo vodoroda, okisi azota i dvuokisi ugleroda v gasakh izlucheniem impul snogo lazera na ftoristom vodorode). Text in Russian. Kvantovaya Elektron., no. 8:1805-1811, 1974. 11 refs.*

Experimental results on detection of micro-concentrations of hydrogen fluoride, nitric oxide, and carbon dioxide molecules in air and in oxides are given. These results were obtained by an optical-acoustic method making use of a hydrogen fluoride pulsed laser. In the pulsed regime the laser gives substantially more energy than in the continuous regime. This property of the pulsed laser allows detection of the minimal concentration of impurity in the air (1 ppm). The system was absolutely calibrated on a standard mixture. The results on detection of HF, NO, and CO2 molecules and relationships between energy and coefficient of absorption and between output signal and pressure of pure CO2 are given. Continuously tunable lasers should be used to increase sensitivity and selectivity.

60174 **APTIC NO. 81851**

Gordon, Glen E., William H. Zoller, Ernest S. Gladney, and Robert R. Greenberg

THE USE OF INSTRUMENTAL NUCLEAR ACTIVATION METHODS IN THE STUDY OF PARTICLES FROM MAJOR AIR POLLUTION SOURCES. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 344-355. 23 refs. (July 29-31.)*

NTIS: CONF-740701

The use of instrumental neutron activation analysis and photon activation analysis for the elemental analysis of particulates emitted from major pollution sources is discussed. Neutron activation analysis can be used for the routine analysis of at least 25 elements, while photon activation analysis can be routinely used for at least 16 elements in particulate matter. Better nuclear methods are needed for several elements, however, particularly for sulfur, beryllium, and cadmium. Enrichment factors for different coal-fired power plants are comparable for most elements, major exceptions being chromium, vanadium, zinc, lead, selenium, and arsenic. The enrichment factors of several elements on particles from coal-fired power plants do not appear to be great enough to account for observed urban enrichment values, whereas municipal incinerators emit particles having extremely high enrichment factors for several elements. A tabulation of enrichment factors for in-stack particles from three coal-fired power plants is given for the following elements: potassium, calcium, barium, bromine, iodine, scandium, titanium, vanadium, chromium, iron, cobalt, nickel, zinc, arsenic, selenium, zirconium, molybdenum, antimony, lead, and the rare earths.

60175 **APTIC NO. 81805**

Harrison, J. F. and R. A. Eldred

AUTOMATIC DATA ACQUISITION AND REDUCTION FOR ELEMENTAL ANALYSIS OF AEROSOL SAMPLES. *Preprint, California Univ., Davis, Crocker Nuclear Lab., 11p., 1974 (?). 10 refs.*

An automatic data acquisition and reduction system for the elemental analysis of aerosol samples is described. The background is subtracted from each energy spectrum, and peak centers are located automatically using a Gaussian correlation technique. Peak multiplets are resolved with Gaussian fits. Peak energies are compared with entries in a table of X-ray lines for possible identification, and multiple identification of peaks and line interferences are resolved. The elemental amounts are determined from the areas of the Gaussian fits. No correction is made for matrix effects, although the correction can be estimated from samples of aerosols containing known elemental ratios. It can also be estimated by comparing the X-ray results with those obtained by methods not involving

X-rays such as elastic alpha scattering and neutron activation. (Author abstract modified)

60176 **APTIC NO. 83845**

Hashimoto, Yoshikazu, Hideko Kishi, Tsunehiko Okura, and Kikuo Oikawa

ACTIVATION ANALYSIS OF ENVIRONMENTAL SAMPLE. *(Kankyo shiryo no hoshaka bunseki). Text in Japanese. In: Report of Atomic Pile Cooperative Use and Research. Rikkyo Univ. (Japan), p. 10-12, 1974. 4 refs.*

In simultaneous multi-element analysis by neutron activation analysis, the handling of samples, gamma ray spectrum data, processing, time and economical problems in irradiation--cooling process were evaluated for the purpose of developing an efficient analysis method. The improvement in sensitivity and economy by proper selection of irradiation--cooling cycle, the recording of gamma ray spectrum data on magnetic tape, and totally automatic data processing using computers were investigated. Descriptions of standard samples used (bovine liver and orchard leaves), sample preparation, irradiation (TRIGA-Mark II, short-life nuclide, 10 min, long-life nuclide 6 hrs), measurement (short-life nuclide 700 sec, 5 min cooling; long-life nuclide 2000 sec, 24 hr cooling; long-life nuclide 4000 sec, 20 days cooling), and data processing using UNIVAC 1106 are given with examples of analysis results. The results were generally in good agreement with NBS standard values, indicating the effectiveness of this analysis method for biological samples.

60177 **APTIC NO. 75957**

Hedley, W. H., H. R. DuFour, W. R. Feairheller, D. L. Harris, T. L. Peltier, and M. D. Schumacher

DESIGN, CONSTRUCTION, AND TESTING OF A COMMERCIAL PROTOTYPE DISC DILUTER (FINAL REPORT). *Monsanto Research Corp., Dayton, Ohio, Dayton Lab., Environmental Protection Agency Contract 68-02-0716, Program Element 1AA010, ROAP 26AAP, Rept. EPA-650/2-74-055, 85p., July 1974.*

A prototype disc diluter is described in terms of its design, construction, and operation during laboratory and field tests. The system dilutes high concentrations of stack gases and conducts them to a point outside the stack where ambient air monitors can be used to measure the source concentration. The device provides the necessary dilution to be compatible with ambient air sampling devices for sulfur dioxide and nitrogen oxides and also reduces the particulate and water vapor levels to values that do not interfere with the ambient air sampling devices. A correction factor is necessary in the theoretical dilution ratio to determine pollutant concentration because of the contraction of higher temperature stack gases at ambient temperatures. Excellent results during field testing were obtained over a range of temperatures from ambient to 550 F.

60178 **APTIC NO. 82111**

Herington, E. F. G.

RECOMMENDED REFERENCE MATERIALS FOR THE REALIZATION OF PHYSICOCHEMICAL PROPERTIES. *Pure Appl. Chem., 40(3):393-397, 1974. 6 refs.*

Many measuring systems and instruments are currently in use which yield results whose uncertainty of measurement and limits of error cannot be established without the employment of reference materials with known properties. As pure substances are materials of definite chemical composition, they are usually more easily characterized than mixtures and are therefore frequently the materials of choice as reference materials. Two main classes of reference materials for physicochemical measurement are proposed: primary substances and calibration and test materials. Primary substances are required for the realization of measurement scales. They are required to be pure substances. Calibration and test materials may be used to calibrate instruments or to realize a practical scale which cannot be defined directly in terms of the base units. It may be inconvenient to realize a unit directly; instead it may be more convenient to transfer a unit from a standardizing laboratory to a working laboratory by using a calibration and test material.

60179 **APTIC NO. 76559**

Higashino, Ichiro, Shigeyuki Morita, and Kohei Enmeiji

OPTIMIZING CONTROL OF INTERNAL COMBUSTION ENGINES. *(Nainen kikan no saitekika seigyo). Text in Japanese. Nippon Jidosha Kenkyujo Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 30:87-95, Sept. 1974. 2 refs.*

The Laboratory Engine Optimalizing Control System (LEOCS), used to establish optimum control conditions for driving performance indexes under different driving conditions, is described. Various detectors, placed on the test engine to measure operating conditions, and various actuators to control as many engine parameters as possible, were connected to a mini-computer, which processes information and maintains optimum conditions. By changing the software system, various algorithms could be tested. Off-line systems were used to calculate feedback control of carbon monoxide emissions and A/F for net thermal efficiency. On-line systems are being developed.

60180 **APTIC NO. 67073**

Hinners, Thomas A., Willie J. Terrill, and Anthony V. Colucci

CONCENTRATION-DEPENDENT IONIZATION LOSS IN ATOMIC ABSORPTION SPECTROSCOPY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Bioenvironmental Lab. Branch, 9p., 1974 (?). 4 refs.*

Alkali metals and alkaline earth metals tend to ionize in atomic absorption flames, resulting in a reduction in the measurable nonionized atomic species. Other alkali metals are typically added in high concentration to suppress this loss. The risk of adding impurities with the suppressing ion prompted a study of a method of standard additions. Measurements were made for potassium when sodium or other alkali metal was not added as a suppressant. The measurable proportion decreased with decreasing concentration over the common analytical concentration range for potassium. The behavior was consistent with increasing ionization of potassium in the flame as the concentration of potassium in the solutions aspirated decreases. This trend appears to be analogous to the increased disassociation of some molecules (such as acetic acid) with decreasing concentration. Application of the method of standard additions to the potassium solutions investigated did not allow valid analysis by the linear extrapolation technique. The addition of sodium (1000 micrograms/ml) to the potassium solutions eliminated this nonlinear atomic absorption behavior. Thus, the practice of adding a suppressing metal is preferable to the use of the method of standard additions in the analysis of ionizing metals by atomic absorption or flame emission spectroscopy. (Author abstract modified)

60181 **APTIC NO. 76266**

Honma, Katsunori

FLOW METER OF HIGH-VOLUME SAMPLER AND FLOW CALIBRATION METHOD. *(Hai boryumu sanpura no ryuryokei oyobi sono ryuryo kosei hoho ni tsuite). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Annu. Rept. Natl. Inst. Ind. Health), vol. 1974:58, 1974.*

In high-volume air samplers, a type of flow meter activated by wind pressure at the outlet which gives only instantaneous readings of the flow rate is used. Various error factors involved in the measurement of flow rates are discussed, and the use of an integrating flow meter or flow rate recording type flow meter is recommended. For the calibration of flow meters, the standard orifice method is generally used. Shortcomings of the orifice method are discussed, and the use of a

Root s meter with an accuracy of + or - 1% is proposed for the calibration. A flow meter system with a Root s meter, and the calibration method are described.

60182 **APTIC NO. 84340**

Hughes, G. N. and R. F. Andres

NEUTRAL TIME OF FLIGHT MASS SPECTROSCOPY. A TECHNIQUE FOR ANALYSIS OF AEROSOLS. *AICHE Symp. Ser., 70(137):317-321, 1974. 21 refs.*

A neutral time of flight mass spectroscopic technique for the analysis of aerosols is described. The technique uses the nonequilibrium characteristics of a supersonic free jet in which heavy species are expanded in a light carrier gas through a sonic orifice into a vacuum. The method leaves the sample largely free from modification during the measurement and offers the possibility of determining not only the original size distribution but also the composition of particles. Theoretical calculations for resolution and sensitivity imply that NTOFMS can be used for particles up to 100 A and possibly 1000 A in diameter. (Author conclusions modified)

60183 **APTIC NO. 81971**

Jensen, B. and J. W. Nelson

NOVEL AEROSOL SAMPLING APPARATUS FOR ELEMENTAL ANALYSIS. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 366-375, AT(49-7)3140. (July 29, 30, 31.)*

NTIS: CONF-740701

The design and operation of two filter type samplers that allow for total filter collection of airborne particulates in a time sequence suitable for analysis by sensitive nuclear techniques are described. The first sampler is designed for discrete time intervals of up to 2 hr which are determined by a commercially available programmable time switch. This switch energizes a small motor at preset times to rotate into sampling position a series of 14 filters which are held on the outer rim of a disc. The other sampler produces a continuous sample on a 5-millimeter wide strip for a period of 1 wk. A sucking orifice is moved by a synchronous motor-screw drive across the filter surface at a rate of 1 mm/hr. Both samplers require only the smallest of the motor driven vane type pumps due to their small filter area.

60184 **APTIC NO. 84235**

Kabeya, Toyoshige

THE EFFECT OF PARTICLE SIZE DISTRIBUTION ON THE MEASUREMENT OF PARTICLE CONTENT. *(Funjin sokutei ni okeru ryudo bunpu no eikyo ni tsuite). Text in Japanese. Preprint, Japan Industrial Safety Assoc., Tokyo, p. 200-203, 1974. (Presented at the Industrial Safety and Hygiene National Meeting, Tokyo, Japan, Nov. 16-18, 1974.)*

Experimental data obtained by different measuring instruments were compared. The instruments were a high volume air sampler made by the Shibata Chimical Co. and equipped with a Type 2 filter of the Toyo Filter Paper Co.; a low volume air sampler made by the same company and equipped with a Type AP-200 filter of the Toyo Filter Paper Co.; a digital dust meter made by the same company; and an Andersen sampler made by the Koritsu Machine Co. and equipped with a Type KA-200 filter of Toyo Filter Paper Co. The samples were collected in copper alloy foundries at the site of band saw cutting, a melting furnace, a grinding operation, and in a molding factory. Particle size distribution was very different from one sample to the next. For example, the sample collected before a melting furnace contained 47.9 wt% of particles larger than 11 micrometer in diameter, wheras the sample collected at a band saw cutting site contained only 20.9%. Generally speaking, the 4 instruments used in the present study gave similar values when the particles were finer. The data obtained by the high volume sampler gave highest values. The digital dust meter gave the lowest values. The other two gave values in-between. All the instruments except the high volume sampler gave similar values, which were quite acceptable.

60185 **APTIC NO. 79892**

Kopriva, Emil

APPLICATION OF THE FRENCH SOUFRE FUMEE METHOD FOR DAILY MEASUREMENTS OF SULFUR DIOXIDE AND SOLID AEROSOL EMISSION. *(Stanoveni dennich hodnot imise SO2 a tuheho aerosolu francouzkou metodou Soufre-fumee). Text in Czech. Ochrana Ovzdusi, 6(8):109-115, Aug. 1974.*

A total of six experiments dealing with testing and calibration of the French SF-8 equipment with various Czechoslovak substitute parts are described. A test of 10 gasometers yielded an average accuracy of -0.17 + or - 0.65% for French models and -0.44 + or - 3.35% for the CSSR models. The reproducibility of measurements was 0.53 + or - 0.37% and 0.82 + or - 0.49%, respectively. Tests of 10 different switches for automatic change of sampling containers yielded an accuracy of 0.52 + or - 0.21% and a reproducibility of results of 0.16 + or - 0.06%. Reproducibility of measurement was tested for 15 air pumps (volume of air sampled) with the following results: 0.67 + or - 0.39% for English models, 0.62 + or - 0.38% for French models and 2.06 + or - 0.70% for CSSR models. The applicability of international calibration curves for solid aerosols was verified qualitatively on the basis of measurements performed in the Most and Ostrave regions but a quantitative measurement by gravimetric methods showed that results obtained from this curve are 70% higher. The accuracy of the reflectometer was checked and found to be remarkably better than manufacturer s specifications.

60186 **APTIC NO. 83466**

Kopyt, N. K. and M. N. Chesnokov

ESTIMATION OF THE OPERATIONAL EFFICIENCY OF IMPACTORS DURING SAMPLING FROM FLOWS. *In: Advances in Aerosol Physics. V. A. Fedoseev (ed.), No. 7, New York, John Wiley and Sons, 1974 (?), p. 72-76. 6 refs.*

The sampling efficiency of two six-stage cascade impactors with different nozzle slit areas was determined for particle fall into the sampling tube and collision efficiency of the particles with the impactor slides. The flow rate through the sampling tubes was 1000 cu cm/sec, and flow velocities at the nozzle slit were varied from 7.13-2600 m/sec. The sampling efficiency of each impactor decreased for large particles with increasing flow velocity. The sampling efficiency of each impactor at flow velocities up to 60 m/sec was sufficiently high for particle sizes between 0.7 and 0.25 micron; however, when the flow velocity was increased to 1100 m/sec, the impactor with a smaller nozzle slit area was more efficient for sampling small particles.

60187 **APTIC NO. 76030**

Kuz mina, T. A.

DETERMINATION OF VOLATILE FLUORIDES EMITTED BY ALUMINUM PLANTS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 5 refs. Translated from Russian, 5p.*

The efficiency of sorption tubes that trap silicon tetrafluoride and hydrogen fluoride for measurement was tested with a range of known concentrations, and at different rates of drawing air through the tubes. One tube containing a 1 ml layer of solid sorbent absorbed almost all the SiF4 and HF at 10 l/min. A Richter device was used to measure fluorides that slipped through the tube. The influence of several atmospheric cations that enter the absorbing solution during measurement of the fluorides in the solution was also tested. No effect on the measurement of fluorides was found for a 100-fold excess of calcium, cadmium, lead, zinc, or chromiun cations, or for a 10-fold excess of iron cations. Silicon tetrafluoride is emitted in significant quantities with HF in some industries. Its generation for lab study is complicated because it tends to hydrolyze and to be sorbed on glass. A device that solves this problem and is effective for generating microconcentrations of SiF4 in air is described.

60188 **APTIC NO. 70631**

Lannoye, Robert A. and Ronald A. Greinke

AN IMPROVED FLUOROMETRIC METHOD OF ANALYSIS FOR BENZO(A)PYRENE IN AIRBORNE PARTICULATES. *Am. Ind. Hyg. Assoc. J., 35(12):755-765, Dec. 1974. 11 refs.*

An improved fluorescence-spectrophotometric method for analysis of the carcinogen benzo(a)pyrene in airborne particulates is described. Benzo(a)pyrene (Bap) and other polynuclear aromatics are extracted from filter samples in a Soxhlet apparatus, followed by isolation of BaP from an aliquot of the filtrate by thin-layer chromatography (on alumina-coated sheets). The migrated BaP spot is eluted with a mixed solvent which is then evaporated. After dissolution of the residue in nitrogen-purged sulfuric acid, the BaP content is measured fluorometrically near 520 nm excitation and 540 nm emission wavelengths. Standards of pure BaP which are carried through the procedure are used for reference in the calculations. The relative standard deviation of the improved method varies between 3.5 and 6.2% for BaP levels of 15-400 nanograms.

60189 **APTIC NO. 75992**

Lapson, W. F. and H. J. Dehne

DESIGN, DEVELOPMENT, AND FABRICATION OF A PROTOTYPE HIGH-VOLUME PARTICULATE MASS SAMPLING TRAIN (FINAL REPORT). *Aerotherm/Acurex Corp., Mountain View, Calif., Environmental Protection Agency Contract 68-02-1339, Program Element 1AB012, ROAP 21ADJ-080, Rept. EPA-650/2-74-067, 7079, 40p., May 1974. 1 ref.*

NTIS: PB 245196/AS

The design, development, and fabrication of a prototype high-volume particulate mass sampling train for stack monitoring are described. The sampling train is characterized by the following features: modular assembly, portability, a sampling rate of 5-10 cfm, probe and oven temperatures of up to 500 F, and conformance to the basic requirements of the Federal Register Method 5 standards of performance for new stationary sources. The sampler is not much larger than a conventional sampler operating at 1 cfm. (Author abstract modified)

60190 **APTIC NO. 83313**

Lewis, Robert E.

METHOD AND APPARATUS FOR MONITORING AND CORRELATING VISIBLE ENVIRONMENTAL CONTAMINATION. *(Timelapse, Inc., Mountain View, Calif.) U. S. Pat. 3,841,763. 11p., Oct. 15, 1974. 3 refs. (Appl. June 25, 1973, 19 claims).*

A photographic photometry apparatus and method for continuously, automatically monitoring a pollutant source and recording pictorial data of visible environmental contamination is described. The method and apparatus provide for a permanent pictorial recording of the environmental contamination which allows for a permanent on the spot continuous relative comparison and rating of the degree of contaminants relative to pre-established standards. There is no other method with these advantages. (Author abstract modified)

60191 **APTIC NO. 81853**

Litman, Robert, Harmon L. Finston, and Evan T. Williams

EXAMINATION OF SOME CURRENT PROCEDURES FOR TRACE MERCURY DETERMINATION: THE ADVANTAGE OF NEUTRON ACTIVATION AND X-RAY COUNTING. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 81-94. 8 refs. (July 29-31.)*

NTIS: CONF-740701

A neutron activation procedure for the determination of mercury in biological and environmental samples is described that avoids sample pretreatment losses associated with adsorption and volatilization. The method involves no sample pretreatment, except for homogenization, after which the samples are immediately sealed in quartz ampoules. The samples are irradiated, and a small germanium (lithium) detector is used to count the 70 KeV X-rays of gold-197. Mercury levels determined by the method for the following National Bureau of Standards standard reference materials are reported: orchard leaves (SRM 1571), bovine liver (SRM 1577), and coal (SRM 1630). (Author abstract modified)

60192 **APTIC NO. 81852**

Macias, E. S. and R. B. Husar

HIGH RESOLUTION ON-LINE AEROSOL MASS MEASUREMENT BY THE BETA ATTENUATION TECHNIQUE. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 413-423. 5 refs. (July 29-31.)*

NTIS: CONF-740701

A two-stage on-line mass monitor with an aerosol size separator employing the beta attenuation technique is described for the high resolution monitoring of atmospheric aerosols. The instrument independently analyzes the mass concentration of two particle size fractions. Coarse particles are inertially separated by impaction on mylar film coated with a silicone adhesive. The fine particle fraction is collected on a high efficiency glass-fiber filter. Carbon-14 is used as a source of beta particles which are detected by a solid-state silicon surface-barrier detector coupled to fast low-noise nuclear electronics. The output of the system is sent to a high speed counter interfaced to a programmable calculator which calculates the mass concentration of each size fraction and stores the data on tape. Field tests involving the sampling of atmospheric aerosols over a 1-week period indicate that the instrument is capable of ambient air monitoring with a time response of about 10 min. (Author abstract modified)

60193 **APTIC NO. 79627**

Maffiolo, G. and J. Dubois

LABORATORY INVESTIGATION OF THE CHARACTERISTICS OF SOME SULFUR DIOXIDE ANALYZERS OR ACID GASEOUS POLLUTANT INDICATORS. *(Etude en laboratoire des caracteristiques de quelques analyseurs de dioxyde de soufre ou d indices de pollution acide gazeuse dans l air ambiant). Text in French. Bull. Dir. Etud. Rech. Ser. A., no. 3/4:75-90, 1974. 6 refs.*

Comparative laboratory investigations of sulfur dioxide analyzers (Beckman model 906 A, Philips PW 9700, Technicon Air Monitor IV), and of acid-smoke indicators (Biolafitte model AF2 and Seres) are presented. Beckman model 906 A, Philips PW 9700 and Technicon Air Monitor IV analyzers were found to be satisfactory as to their precision and to their behavior with respect to interference. The readings of Biolafitte AF2 and Seres analyzers were greatly influenced by different factors, such as the mode of preparation and the age of the sodium borate solution, and by the pH value. Carbon monoxide did not interfere with the readings of the Philips PW 9700, Technicon Air Monitor IV, Biolafitte AF2, and Seres analyzers.

60194 **APTIC NO. 81965**

Mandler, J. W. and R. A. Semmler

TRACE ELEMENT ANALYSIS USING CHARGED PARTICLE TECHNIQUES. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 130-140. 2 refs. (July 29-31.)*

NTIS: CONF-740701

The nondestructive measurement of trace elements via charged particle techniques is discussed, with particular emphasis on nuclear activation analysis and proton-excited X-ray fluorescence. The detection limits of these charged particle techniques are generally in the 1-10 microgram/g range, although for certain elements detection limits below 0.1 microgram/g are attainable. X-ray fluorescence is more sensitive for heavier elements (above sodium in the periodic table), while neutron activation is more sensitive for lighter elements (below silicon). The two techniques require only a modest particle accelerator (e.g., a 1.5 - or 2-MeV Van de Graaff type). Charged particle elemental analyses of urban aerosol particles are illustrated for magnesium, aluminum silicon, phosphorus, sulfur, chlorine, potassium, calcium, titanium, chromium, vanadium, manganese, iron, copper, zinc, selenium, bromine, and lead.

60195 **APTIC NO. 79994**

Matsushita, S., K. Arashiya, M. Nakazawa, Y. Saiki, and S. Miyazaki

ANALYTICAL METHOD OF POLYNUCLEAR AROMATIC HYDROCARBONS IN THE AUTOMOBILE EXHAUST GAS. *(Jidosha haishutsu gasuchu no takan hokozoku tankasuiso no bunsekiho). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Ann. Rept. Natl. Inst. Ind. Health), vol. 1974: 49, 1974.*

A collection technique for the polynuclear aromatic hydrocarbons in automobile exhaust gas was studied using a domestic automobile with a 1980 cc engine. When the particles in the exhaust gas were directly collected on two glass fiber filters in series using a high volume air sampler (500 l/min) for 3 min or using a low volume air sampler (30 l/min) for 10 min, the collection efficiency for benzo-a-pyrene on the filters was very poor in both collection techniques, and the efficiency of the low volume air sampler was nearly zero. The poor collection efficiency was attributable to the high sublimation character of benzo-a-pyrene, which exists in a gaseous state in high temperature exhaust. An alternative collection method was studied, in which the exhaust gas was first cooled by passing through a water-cooled (0 C) tube, and then was bubbled through an ice-water bath before being passed through glass fiber filters. Analysis of the trapped material both in the ice-water bath and on the filters showed an added collection efficiency for benzo-a-pyrene from 97.6 to 99.6%. As long as the engine operation was kept constant, a constant benzo-a-pyrene level was found in the exhaust gas. The analytical result of 7 major polynuclear aromatic hydrocarbons indicated that their levels in exhuast gas increased with increased carbon monoxide in the exhaust gas.

60196 **APTIC NO. 84317**

Moore, L. J., J. W. Gramlich, and L. A. Machlan

APPLICATION OF ISOTOPE DILUTION TO THE HIGH ACCURACY TRACE ANALYSIS OF ENVIRONMENTAL AND HEALTH STANDARDS. *Preprint, National Bureau of Standards, Washington, D. C., Analytical Chemistry Div., 11p., 1974. 13 refs.*

The use of isotope dilution mass spectrometry for high accuracy trace analysis of environmental and biological samples is discussed. Presently, more than 20 elements can be analyzed by IDMS at either the ppm or ppb level with measurement errors not exceeding 0.25-0.50%. Isotope dilution mass spectrometry is also being used as a reference trace analytical tool for the development of accurate analytical techniques using the more frequently employed atomic absorption and emission spectrometry techniques. Analytical data are provided for rubidium and strontium in fly ash, molybdenum and Sr in orchard leaves, and lead in porcine blood. (Author abstract modified)

60197 **APTIC NO. 79721**

Murphy, John N.

EVALUATION OF PRESENT INSTRUMENTS AND NEW DEVELOPMENTS EXPECTED IN MONITORING CONTAMINANTS IN MINE ATMOSPHERES. *In: Proceedings of the Symposium on the Use of Diesel-Powered Equipment in Underground Mining, Pittsburgh, Pa., Jan. 30-31, 1973. Bureau of Mines, Information Circ., no. 8666:232- 275, 1974. 9 refs.*

Instrumentation for monitoring contaminants in mine atmospheres is evaluated. Requirements of the proposed regulations on diesel powered equipment for coal mines and gassy metal and nonmetallic mines include limitations on the concentrations of carbon dioxide, carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, and oxygen, and requirements on minimum ventilation in places where diesel engines are operated. Instrumentation for providing instantaneous indications of contaminant concentrations, small personal alarms which only indicate when certain threshold values have been exceeded, and dosimeters which measure the dosage are reviewed. Recommendations for calibration procedures and frequency of calibration are reviewed and performance requirements and test procedures for candidate instruments are proposed. The techniques used include stain tubes, electrochemical cells, solid state gas detectors, colorimetry, electrical conductivity, catalytic conversion, thermoconductivity, optical spectroscopy, ionization, refractive index, mass spectrometry, paramagnetism, gas chromatography, and chemiluminescence.

60198 **APTIC NO. 82872**

Nozaki, K. and Shigeharu Koshi

MINERAL DUST. (50) DETERMINATION OF ASBESTOS DUST. *(Kobutsu-sei funjin. (50) Asubesuto funjin no sokutei). Text in Japanese. Rodo Eisei Kenkyusho Nenpo (Annu. Rept. Natl. Inst. Ind. Health), p. 60-61, 1974.*

Preliminary experiments on measurement of asbestos dust were conducted in the laboratory, to examine problem points in the enforcement of environmental standards for asbestos dust. Oil (Zedel oil, nd 1.517 can be used) and a membrane filter were used to measure the optical density of asbestos. The most suitable index of refraction (nd) of the oil medium seemed to be about 1.466. If measurements are taken 2-7 days after samples are made up, nd can vary + or - 5% (from 1.392 to 1.593). Asbestos fibers can be differentiated in mixtures of natural dusts: calcium carbonate, quartz, fly ash, chrysotile. In artificial dusts such as those containing glass fibers, pulp fibers (facial tissue), or wool, differentiation of asbestos is difficult, unless its original shape and optical structure are known. Differentiation is nearly impossible in a mixture of asbestos and facial tissue fibers. Mixtures of glass fiber and asbestos could be differentiated with a mineral ore microscope using polarized light. Counting the number of asbestos fibers in a given optical field is a subjective matter. Variations as much as 25-40% seem to occur in the counting of a total of 200 fibers. Dependence on the capability (good or poor resolution) of the microscope is also apparent.

60199 **APTIC NO. 79836**

Ohshiman, Tsugukage

STANDARD-GAS GENERATORS FOR POLLUTION ANALYSIS. *(Kogai keisoku yo hyojun gasu hassei sochi). Text in Japanese. Oyo Butsuri (J. Japan Soc. Appl. Phys.), 43(5):518-520, 1974. 16 refs.*

Two general categories (static and dynamic) for generation of standard gases for use in pollution analysis are described, together with the various methods belonging to each. Since September 1972, MITI has allotted $550,000 for a 2-year project to develop standard-gas generators for use in pollution detection devices. One generator, in trial operation since April 1974, is of the dynamic type. Active component gas of high purity is mixed with carrier gas in accurate proportions, and standard gas (0.1 ppm to 20%) is continuously generated. Precise control of the micro-flow of gas is monitored by a single tube manometer which utilizes 56 glass capillaries and silicone oil. The liquid sealant does not come into direct contact with the active component of the gas. Standard gases which are generated include sulfur dioxide, nitric oxide, nitrogen dioxide, propane, and carbon monoxide with precision of + or - 1 to 1.5%. Artificial air or nitrogen is used as carrier gas. Rate of gas generation is 0.5-10 l/min; temperature of generated gas, 25 + or - 1 C; pressure of generated gas, above 10 mm Aq. A mini-computer controls the unit, which can generate gases at desired concentrations continuously for more than 4 hr.

60200 **APTIC NO. 76031**

Pavlenko, A. A.

DETERMINATION OF HYDROGEN SULFIDE IN THE ATMOSPHERE. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 6 refs. Translated from Russian, 5p.*

A method for measuring hydrogen sulfide that is sufficiently sensitive to measure it in the atmosphere in minute concentrations, and that does not require the use of poisonous sodium arsenate, is described. A complex of cadmium with triethanolamine is used as an absorbent solution for H2S, which is determined from alkaline methylene blue upon adding dimethylphenyldiamine in the presence of ferric chloride (FeCl3). The complex replaces the previously used hydrate of cadmium. The maximum permissible concentration of H2S in the atmosphere is 8 microgram/cu m, and this method shows promise for stable measurement in this range.

60201 **APTIC NO. 79162**

Peacy, Jon

A GRAVIMETRIC TECHNIQUE FOR DETERMINING THE PERCENTAGE OF WATER VAPOR IN FLUE GAS. *American Society of Mechanical Engineers, New York, Incinerator Div., Natl. Incinerator Conf. Resour. Recovery Thru Incineration, Miami, Fla., 1974, p. 161-171. 6 refs. (May 12-15.)*

A gravimetric technique for determining the percentage of water vapor in flue gas during source testing is described. The technique is based on the adsorptive powers of various desiccants and involves a comparison between their dry weight and their weight after exposure to the flue gas. Laboratory and field tests reveal that molecular sieve 4A is the best dessicant for the above purpose followed by activated alumina. Unlike molecular sieve 4A, the activated alumina requires no pretreatment and is also much less expensive.

60202 **APTIC NO. 67113**

Price, B. J. and K. M. Field

THE DIRECT ANALYSES OF S AND PB IN FUELS BY NONDISPERSIVE X-RAY FLUORESCENCE. *Am. Lab., 6(9):62-64, 66, Sept. 1974.*

The direct analysis of sulfur and lead in fuels by nondispersive X-ray fluorescence is discussed. For general fuel oil analysis of S, the range of concentration of interest is from 0.1 to 4%. The accuracy requirements are easily met because the level of precision for the standard instrument is such that a standard deviation better than 0.005% S at the 0.5% level is achieved in a 50 sec analysis time. Lead analysis in gasoline is at a stage where it is possible to produce results suitable for general analysis, and instruments are already being used for routine Pb analysis. Progress in this application for nondispersive analyzers is expected to increase. (Author conclusions modified)

60203 **APTIC NO. 79808**

Pueschel, Rudolf F.

RECENT DEVELOPMENTS IN CHEMICAL AEROSOL ANALYSIS. *In: Atmospheric Physics and Chemistry Laboratory Collected Reprints 1973. National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Lab., p 112-131, Nov. 1974. 13 refs. (Presented at the Inadvertent Weather Modification Workshop, Logan, Utah, Aug. 13-31, 1973.)*

GPO

A laser spectroscopic particle analyzer has been developed and elemental analysis is performed using a combination of scanning electron microscopy and energy dispersive X-ray analysis. The laser spectroscopic particle analyzer uses a laser to provide energy and measures the emission spectra of the particles. It can be used in determining the chemical makeup of the particles and eventually the aerosol absorption. A scanning electron microscope interfaced with an energy dispersive X-ray analyzer can provide information on the size, shape, and chemical composition of aerosol particles. These methods of determining the elemental composition of individual aerosol particles makes it possible to identify manmade aerosols; thus, changes in nuclei concentrations can be correlated with human activities. A second area for applying these techniques is a study of the transformation of initially inert particles into potential freezing nuclei when trace substances change their surfaces. The capability to determine the locale of the nucleus within the crystal makes it possible to determine the extent contact nucleation occurs in nature. (Author abstract modified)

60204 **APTIC NO. 79279**

Quebedeaux, W. A., M. F. Terraso, N. W. Tyler, Jr., A. T. Hugh, and J. Harris

METHODS FOR THE CAPTURE AND IDENTIFICATION OF ORGANIC ODORS. *In: Industrial Odor Technology Assessment. Paul N. Cheremisinoff and Richard A. Young (eds.), Ann Arbor, Mich., Ann Arbor Science Publishers, Inc., 1974 (?), Chapt. 6, p. 83-94. 2 refs.*

Methods for the capture and identification of acrylate and amine odors are described. The acrylate capture technique utilizes carbon adsorption and a calibrated high-volume air sampler. The extraction of the sample for gas chromatographic analysis involves placing an extraction thimble containing the sample into a Soxhlet extraction apparatus and refluxing with a minimum volume (20.0 ml) of carbon disulfide for 1 hr. The resultant extract is suitable for gas chromatographic analysis using a flame ionization detector. The amine capture system employs a strong cation exchange resin (sulfonated polystyrene copolymer) of medium mesh size prepared in an aqueous solution of 0.5% glacial acetic acid. A piece of indicator (ninhydrin) impregnated filter paper is attached to the influent funnel of the capture apparatus. The exhaust port is connected to a vacuum pump in a series with a flow meter when the instrument is ready for use. Color production on the filter paper allows the investigator to determine if the suspected compound is actually being captured. The initial step in identification is thin-layer chromatography. Following the separation of the sample into primary, secondary, and tertiary amine subgroups, thin-layer chromatography can be used to provide both qualitative and quantitative information on the captured amines.

60205 **APTIC NO. 79727**

Rappne, Sik Stefania

ANALYTICAL CHEMISTRY IN ENVIRONMENTAL PROTECTION. *(Az analitikai kemia jelentosega a kornyezetvedelemben). Text in Hungarian. Magy. Kem. Lapja (Budapest), 19(11-12):613-615, 1974.*

Methods and instruments for the measurements of air pollutants are discussed. Variables affecting the selection and application of particular methods are discussed. Commercially available equipment for measuring the sulfurous air pollutants are described. Other topics include: analysis of gaseous and particulate pollutants, analytical requirements, and development of instruments.

60206 **APTIC NO. 75996**

Reckner, Louis R.

DEVELOPMENT OF TECHNICAL SPECIFICATIONS FOR STANDARD GAS- DILUENT MIXTURES FOR USE IN MEASUREMENT OF MOBILE SOURCE EMISSIONS. *Scott Research Labs., Inc., Plumsteadville, Pa., Environmental Protection Agency Contract 68-02-0652, Program Element 1HA327, ROAP 26ADZ, Rept. EPA-650/4-74-020, 70p., June 1974. 3 refs.*

NTIS: PB 245050/AS

The stability of gas mixtures of carbon monoxide in nitrogen and propane in air in high-pressure cylinders was investigated as part of an effort to develop technical specifications for standard gas-diluent mixtures used in measurements of mobile source emissions. The effects of the following variables were examined: cylinder wall material, cylinder valve type, cylinder preconditioning procedures, carbon monoxide and propane concentrations, diluent purity, mixing procedures after blending, cylinder storage temperature, cylinder pressure, and the type of pressure-reducing regulator used. Concentration data obtained by periodic analyses of 240 cylinders over a 6-month period were subjected to statistical analysis. The most significant finding was the substantial losses in carbon monoxide concentration which occurred when mixtures were prepared in chrome-moly cylinders. None of the other variables affected the carbon monoxide concentration. All of 120 test cylinders of propane in air satisfied the stability criteria of less than 3% change in 6 mo. (Author abstract modified)

60207 **APTIC NO. 76192**

Reckner, Louis R.

SURVEY OF USERS OF THE EPA - REFERENCE METHOD FOR MEASUREMENT OF NON-METHANE HYDROCARBONS IN AMBIENT AIR. *Scott Environmental Technology, Plumsteadville, Pa., Environmental Protection Agency Contract 68-02-1206, Program Element 1HA327, ROAP 26AAF, Rept. EPA-650/4-75-008, 46p., Dec. 1974. 1 ref.*

NTIS: PG 247515/AS

A survey of users of the Environmental Protection Agency Reference Method for the measurement of non-methane hydrocarbons in ambient air was conducted and resulted in a compilation of 188 NMHC analyzers operated by 70 organizations. Field evaluations were performed on instruments operated by 16 of the users. A series of five gas mixtures in high-pressure cylinders was presented to each operator for analysis. Analytical errors for mixtures containing NMHC at concentrations close to the 0.24 ppm ambient air standard were greater than 100% for six of the users and ranged from 20-100% for another six of the users. Errors ranging between 10-20% were observed among three users, and one user obtained analytical data that were within 10% of being correct. (Author abstract modified)

60208 **APTIC NO. 79810**

Robinson, J. W.

REMOTE SENSING DEVICES FOR AIR POLLUTION CONTROL. *Sci. Total Environ., vol. 3:169-177, 1974.*

Those remote sensing techniques which have been most highly developed and which have commanded the most attention are discussed. They include infrared absorption over long light paths, infrared emission, and the use of lasers. The latter have been used in Lidar techniques, laser Raman sensing methods, and laser induced fluorescence techniques. The present state of the art is discussed together with the potential of these methods. (Author abstract modified)

60209 **APTIC NO. 70618**

Sakai, Kaoru and Toshio Kaneko

A SURVEY OF NEW TECHNIQUES APPLYING SPECTROSCOPY FOR MEASUREMENT OF AIR POLLUTANTS - MEASUREMENT AT EMISSION SOURCES AND LARGE AREA POLLUTION MEASUREMENT. *(Taiki osen no keisoku ni okeru atarashii supekutoru oyo gijutsu no tenbo - hasseigen keisoku to koiki osen keisoku to chushin to shite). Text in Japanese. Keisoku Gijutsu (Meas. Technol.), 2(9):36-42, Sept. 1974. 9 refs.*

A general discussion including examples is given on ultraviolet absorption technique for the measurements of pollutants at emisson sources and the laser-radar method for large area measurement. A second order differential spectrophotometric system of the correlation techniques converts nitrogen oxides into nitric anhydride followed by decomposition of the N2O5 in a heating furnace back into nitrogen dioxide which is detected by two light fluxes at 405 nm and 570 nm. Results of an example show slight interference from SO2. Another spectrophotometer of the correlation techniques developed by Hitachi uses two correlation masks and is able to detect simultaneously NO, NO2 and SO2. This new method also has the advantages of no interferences from water, carbon monoxide, carbon dioxide, ammonia, and hydrogen chloride; and no complications stemming from NO and NO2 conversion. The laser-radar method, which measures the back scattering coefficient, is used for ambient air monitoring, kerosene combustion gas, and automotive exhaust measurements. It is expected that as low as 10 ppb of NO can be detected in the near future.

60210 **APTIC NO. 76036**

Selezneva, Y. S. and V. M. Drozdova

INFLUENCE OF SAMPLING METHODS ON CHEMICAL COMPOSITION OF SAMPLES. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 7 refs. Translated from Russian, 11p.*

Measurements of the chemical composition of atmospheric precipitation can be affected by dry precipitates (e.g., dusts and ash) that can increase the mineralization of samples and alter ion and pH values. These additional sample impurities have a logarithmic normal distribution; thus, extremely large admixtures that interfere with measurement of other pollutants are possible. The amount of settling dusts, and the degree to which they become dissolved in water and thus contribute their chemical constituents to the collected wet sample, depends largely on the sample collection method. Experiments were performed with two groups of sampling funnels. The first group was left outdoors only during rainfall, the second group was left standing during the whole sampling period and was not taken in when rain stopped. The second group gave mineralization readings about 40% higher than the first, presumably due to the dissolving during rainfall of dry precipitates that had settled onto the funnels during dry periods.

60211 **APTIC NO. 84067**

Shiokawa, T., K. Yoshihara, T. Ohmori, G. Izawa, M. Hiraga, S. Ikuta, and K. Okuno

ACTIVATION ANALYSIS OF ATMOSPHERIC SUSPENDED PARTICULATE. *(Taiki-chu fuyujin no hoshaka bunseki). Text in Japanese. In: Report of Atomic Pile Cooperative Use and Research. Rikkyo Univ., Japan, p. 70-71, 1974.*

Suspended particulates and soil samples were analyzed by neutron activation analysis (NAA), and its adequacy was evaluated in comparison to charged particle excitation X-ray analysis (CPEXA) and atomic absorption analysis (AAA). In NAA, the Camberra 4K gamma ray pulse height analyzer with Ge(Li) detector was used for the measurement of gamma ray spectrum, and the nuclide was identified by the half life. In the CPEXA, the X-ray emitted upon protron irradiation on sample was measured and identified by the characteristic X-radiation of each element. The AAA was carried out according to the common procedure. The detection of arsenic was the characteristic of NAA. On the recoil implantation, the chemical form distribution of fission fragments of uranium octoide and phthalocyanine copper mixture was investigated by measuring the gamma ray spectrum of sublimated fractions of neutron irradiated mixtures.

60212 **APTIC NO. 81875**

Souza, Anthony F. and Louis R. Reckner

VARIABILITY IN AIRCRAFT TURBINE ENGINE EMISSION MEASUREMENTS (FINAL REPORT). *Scott Research Labs., Inc., Plumsteadville, Pa., Environmental Protection Agency Contract 68-01-0443, Rept. EPA-460/3-74-006, 96p., Jan. 1974. 2 refs.*

NTIS: PB 251155/AS

Causes of variability in turbine engine emission measurements were studied using a Pratt and Whitney JT8D engine. An exhaust gas mixer and a detailed exhaust gas cross section mapping technique were utilized for the verification of average exhaust emission concentrations. Variability in the measurement of gas turbine emissions was caused by instrument error, calibration gas uncertainty, and deficiencies in exhaust gas sampling and handling techniques. Calibration gas uncertainty was the largest contributor to the variability between two measurement systems. The Environmental Protection Agency specified exhaust gas sample handling and conditioning system was adequate and reliable for handling gas turbine exhaust samples. The exhaust gas mixer technique was not feasible for studying exhaust sampling methods at power levels above idle. Detailed concentration maps appeared to require integration with a mass flow profile for the calculation of true exhaust emission rates. (Author summary modified)

60213 **APTIC NO. 81966**

Spyrou, N. M., K. Ingle, and F. Ozek

CYCLIC ACTIVATION IN TRACE ELEMENT ANALYSIS OF ENVIRONMENTAL SAMPLES. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 106- 122. 6 refs. (July 29-31.)*

NTIS: CONF-740701

A cyclic neutron activation analysis procedure which makes possible the detection of elements which produce short-lived isotopes in irradiation is described. The method involves the repeated cycling of a sample between the irradiating source and the radiation detector, thus enhancing the signal-to-background ratio of the isotope by the proper choice of timing parameters. The neutron source is an in-core-irradiation system. A pneumatic rapid transfer system is used for cycling the sample between the reactor core and a sodium iodide scintillation detector. A brief mathematical description of the various timing parameters involved in the procedure is given along with a graphical interpretation of these parameters. An example involving the application of the technique to the determination of lead in airborne particulate samples via the Pb-207 isotope (0.8 second half life) is presented.

60214 **APTIC NO. 84494**

St. John, Gilbert A. and Michael Anbar

DETERMINATION OF SUBPICOGRAM AMOUNTS OF CHEMICAL AGENTS IN THE ATMOSPHERE. *Stanford Research Inst., Menlo Park, Calif., Dept. of Defense Contract DAAA 15-74-C-0103, Proj. 3122, Rept. EC-CR-74028, 31p., Sept. 1974. 10 refs.*

NTIS, DDC: AD/A-000-886

The feasibility of using field ionization mass spectroscopy for the fast detection, identification, and quantitative assessment of chemical warfare agents emitted into the atmosphere during demilitarization operations was investigated. A mass spectrometer employing a novel field ionization source with high ionization efficiency and low fragmentation, along with a silicone rubber membrane inlet system has been developed. The above mass spectrometer, using simulated atmospheric sampling, can detect war gas simulants in clean, moist air at limits of 0.2 ppb mole ratio for diisopropyl methanephosphonate (simulant of GB), 01. ppb for 2-diisopropylaminoethanethiol (simulant of VX), 1ppb for bis(2-chloroethyl) ether (simulant of mustard gas), and 0.2 ppb for bis(2-methoxyethyl) sulfide (another simulant of mustard gas). Moreover, the above system is potentially capable of continuous monitoring of air, humidity does not interfere, and it has a rapid time response. It was concluded that the development of a transportable field ionization mass spectrometer monitoring system to be used on sites of plants for incinerating demilitarization of chemical warfare agents is feasible and should be pursued.

60215 **APTIC NO. 80276**

Steen, Bengt and Kenth Andreasson

COMPARATIVE MEASUREMENTS OF PARTICLE CONCENTRATIONS IN AMBIENT AIR, MADE AT A BACKGROUND STATION WITH DIFFERENT TYPES OF INLETS FOR HIGH-VOLUME SAMPLERS. *Swedish Water and Air Pollution Research Lab., Rept. B 190, 57p., Dec. 1974. 18 refs.*

Comparative measurements of total particulate and sulfate concentrations were made in a nonurban marine atmosphere. The purpose was to determine if and to what extent the sampling inlet design influenced the results obtained. Two units were built for the sampling of particles at high flow rates. They were identical except for the sampling inlets, which easily could be exchanged. A cylindrical inlet used at 100 cu m/hr will work relatively satisfactorily during most weather conditions. This inlet was therefore considered better suited for sampling of total airborne particulate matter at this nonurban location than the other inlets tested. Different inlets for nonisokinetic sampling of particles in air at a background station will give different results. The errors that are introduced will be larger for total particle mass than for submicron particles as represented here by sulfate concentrations. The errors are small in comparison to the normal fluctuations in concentrations. The sampling errors must be carefully considered when studying large particle size fractions and when making measurements at high wind velocities. An isokinetic sampling method is recommended for investigations of a single episode. (Author abstract modified)

60216 **APTIC NO. 84327**

Stenhouse, J. I. T. and P. J. Lloyd

SAMPLING ERRORS DUE TO INERTIAL CLASSIFICATION. *AICHE Symp. Ser., 70(137):307-309, 1974. 7 refs.*

Errors due to the anisokinetic operation of a tube sampling probe used for sampling a dust-laden gas are described, and a simple theory for the efficiency of anisokinetic sampling is presented. Sampling efficiencies are determined by computing particle trajectories in a simple potential field in the neighborhood of the probe. The results of the theory are in good agreement with experimental determinations despite the use of the simplified flow field and the assumption that the particles are moving in a linear Stokes regime.

60217 **APTIC NO. 73371**

Suzuki, F., M. Minakami, and I. Ogawa

DETERMINATION OF IODINE IN STACK GAS BY AN IODIDE SELECTIVE ELECTRODE. *(Youso ion denkyoku-ho ni yori haigasu-chu youso no teiryo-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):438, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 289.)*

Two sampling bottles connected to the emitting source through a heated sampling tube were each filled with 25 ml of 0.1 N sodium hydroxide as an absorbent. Exhaust gas was sampled at 0.5-2.0 l/min, and the resulting solution was taken to a volumetric flask. The solution was shaken with 2 ml of 1.5 N sodium hypochlorite, and 10 ml of the solution was taken to a 50 ml beaker containing 10 ml saturated hydrazine sulfate. The iodine concentration was then determined by measuring the potential with an iodide ion electrode. No interference from bromide ion, sulfite ion, or ammonium chloride was found. The iodine collection efficiency was more than 99% at 0.5-2.0 l/min sampling velocity.

60218 **APTIC NO. 79838**

Takami, Katsumi, Norio Kaneko, and Chiaki Shinpo

CORRELATION SPECTROSCOPY. *(Sokan bunko ho). Text in Japanese. Oyo Butsuri (J. Japan Soc. Appl. Phys.), 43(4):345-353, 1974. 14 refs.*

Application of correlation spectroscopy to pollution gas analysis is discussed. Correlation spectroscopy is unsuited to the determination of carbon monoxide and hydrocarbon concentrations, because these compounds have an insufficient number of peaks and valleys in their ultraviolet spectra for accurate multi-slit scanning. Correlation spectrometry was used for simultaneous continuous analysis of nitric oxide (2000-2300 A); sulfur dioxide (2800-3100 A); and nitrogen dioxide (4000-4500 A). A heavy hydrogen lamp and tungsten lamp were used together to produce the required wavelengths for analysis. Problems can arise due to gas adsorption on the cell walls; changes in gas composition because of photochemical dissociation; fluorescence scattering; interference from other gas molecules present in the analytical mixture. Analytical results from correlation spectroscopy for standard gases (NO, NO2) were compared to results obtained from other methods (e.g., phenoldisulfonic acid method for total nitrogen oxides (NO + NO2)). After NO2 adsorption reached a saturation state, there was good agreement between correlation spectrometry and PDS method (NOx concentration, 100-800 ppm). For all methods, there existed variations of about 10% between the stated and actually measured values of the standard NOx gas. In determination of SO2 (500 ppm) in boiler exhaust gases, there was agreement within 10% between the values obtained from correlation spectrometry, and values obtained by the flame photometry method.

60219 **APTIC NO. 83610**

Thomas, Robert W.

ATMOSPHERIC SAMPLING PROBE FOR A MASS SPECTROMETER. *(Air Force, Washington, D. C.) U. S. Pat. 3,842,266. 5p., Oct. 15, 1974. 9 refs. (Appl. April 11, 1973, 5 claims).*

A new and improved method for sampling gases at atmospheric pressure is described. It includes a sampling probe which, when coupled with a mass spectrometer, allows a chemically reactive or condensible species of gas to be transported from atmospheric pressure to 10 to the -8th power torr without collision with other molecules or walls of the probe. The unique design of this system allows adjustment of a first orifice in any plane and a second or skimmer orifice in one plane while the system is operating under vacuum. Materials such as stainless steel and quartz are used which allow a 400 C bakeout of the unit while operating. This provides an effective control over contamination which might arise from the probe assembly itself. The successful fabrication of the microorifices and the design of the bakeable stainless probe assembly are the major improvement over other systems. (Author summary modified)

60220 **APTIC NO. 84638**

Tomiyama, Tsuyoshi, Isao Yamamoto, Atsushi Aoki, and Taka Ishii

ACTIVATION ANALYSIS OF AIRBORNE DUST (I). *(Taiki fuyujin no hoshaka bunseki (I)). Text in Japanese. Okayama Rika Daigaku (Okayama Coll. of Science), no. 10:145-154, 1974. 5 refs.*

Neutron activation analysis with high volume high resolution germanium-lithium detectors was used to obtain the concentrations of elements in airborne dust samples which were collected continuously for a month at four stations in the Okayama and Kurashiki districts in April 1974. The samples were collected on membrane filters using open-type low volume air samplers and activated with thermal neutrons in the Kyoto University Research Reactor. Concentrations were determined for seventeen elements. Differences found between sampling stations are discussed and compared to data taken in the Kyoto district in March 1974.

60221 **APTIC NO. 83631**

Umhauer, H.

DETERMINING PARTICLE SIZE DISTRIBUTIONS IN AEROSOL STREAMS OF HIGH CONCENTRATION BY MEANS OF LIGHT SCATTERING APPARATUS. *(Ermittlung von Partikelgroessenverteilungen in Aerosolstroemungen hoher Konzentration mit Hilfe einer Streulichtmesseinrichtung). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 232:101-105, 1974.*

A light scattering apparatus for the determination of particle size distribution in aerosol streams of high concentration is described. The apparatus is especially suitable for the study of aerosol spray cones. The size distribution of particles is obtained through the measurement and analysis of scattered light pulses generated by the individual particles in a small, optically delimited flow field. The measuring system includes a photomultiplier and pulse height analyzer. The distributions of pulse height are measured, and the actual particle size distributions are obtained by conversion on the basis of calibration curves.

60222 **APTIC NO. 76029**

Vol berg, N. S. and I. I. Pochina

CONTINUOUS DETERMINATION OF THE CONCENTRATION OF CARBON MONOXIDE IN THE ATMOSPHERE BY THE COULOMETRIC METHOD. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 12 refs. Translated from Russian, 11p.*

A method and device for detecting carbon monoxide, based on the reduction of CO by iodic anhydride at 120 C and detection of the evolving iodine in a coulometric cell, is described. The cell is a noncirculating type with an impressed voltage. The nondrying electrolyte is a solution of lithium chloride and cadmium iodide. The current output is 94% of the theoretical value in the tested range of CO concentrations from 2 to 50 mg/cu m. Sorbents to trap troublesome impurities were studied, and a system of suitable sorbent substances was selected. A resin (AV-7) was found that reliably absorbs the iodine that is evolved at the electrode, while changing color.

60223 APTIC NO. 76034

Vol berg, N. S. and I. I. Pochina

DETERMINATION OF NITROGEN DIOXIDE IN AIR BY THE COULOMETRIC METHOD WITH PRELIMINARY REACTION. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 12 refs. Translated from Russian, 8p.*

A continuous coulometric measurement method for atmospheric nitrogen dioxide, based on the preliminary interaction of NO2 with solid cadmium iodide at 200 C with subsequent measurement of the evolving iodine, is described. The current output is 91% of the theoretical. A preliminary thermal dissociation of interfering ozone at 500-600 C in an empty quartz tube or a cartridge with finely divided natural rubber is recommended. Solid reagent cadmium iodide provided minimum spontaneous evolution of iodine at the optimum temperature of 200 C, and a minimum retention time for the iodine formed from reaction with NO2. The equipment for this method is not highly complex and is less awkward and laborious to operate than other devices widely used at present.

60224 APTIC NO. 76005

Wesolowski, J. J., E. R. DeVera, Y. Tokiwa, W. Wehrmeister, K. Smith, and M. Imada

EVALUATION OF THE PROPOSED AMBIENT AIR MONITORING EQUIVALENT AND REFERENCE METHODS. *California Dept. of Health, Berkeley, Air and Industrial Hygiene Lab., Environmental Protection Agency Contract 68-02-0744, Program Element 1H1327, ROAP 26AAF, Rept. EPA-650/4-75-014, 239p., April 1974. 10 refs.*

NTIS: PB 245185/AS

An assessment of the adequacy of the Environmental Protection Agency s proposed Ambient Air Monitoring Equivalent and Reference Methods is presented. The equivalency regulations are proposed as a standard set of procedures for establishing the equivalency of non-reference analytical methods to reference methods which are prescribed by the Clean Air Act for the measurement of ambient air quality. The test procedures of the regulations are evaluated in two phases using three automated methods and two manual methods. Comments regarding the proposed regulations submitted to the EPA by respondents are also reviewed. The provisions and specifications given by the regulations are largely consistent with prevailing ambient air measurement technology. Some deficiencies noted include: unclear test directions, inconsistent test requirements, insufficient descriptions of the gas generation systems, redundant test information and procedures, missing performance specifications, poorly organized procedural steps, and typographical errors. (Author summary modified)

60225 APTIC NO. 80259

Williams, David T. and Charles S. Palm

EVALUATION OF SECOND DERIVATIVE SPECTROSCOPY FOR MONITORING TOXIC AIR POLLUTANTS (FINAL REPORT). *Florida Univ., Gainesville, Aerospace Medical Div. Contract F41609-73-C-0011, Rept. SAM-TR-74-19, 124p., Sept. 1974. 21 refs.*

NTIS, DDC: AD/A-000 949

The feasibility of using second derivative absorption spectrometry to analyze toxic gases and vapors was investigated. Test data from scans of 28 different substances are presented for the 2000 to 7000 A spectral region. Substances measured included acetone, ammonia, aniline, benzaldehyde, benzene, dimethylamine, formaldehyde, hydrazine, monomethylamine, nitric oxide, nitrogen dioxide (nitrogen tetroxide), oxygen, ozone, pyridine, sulfur dioxide, toluene, trimethylamine, unsym-dimethylhydrazine, (UDMH), xylene, carbon monoxide, chlorine, chlorine trifluoride, dry and wet diborane, ethyl nitrate, ethylene oxide, fluorine, and monomethylhydrazine (MMH). All but the last eight produced signatures which are quantified in tables of instrument sensitivity values. A special effort was expended in the study of the hydrazines. Hydrazine itself was found detectable in the pure form and via its air reaction product ammonia. Monomethylhydrazine is undetectable in thee pure form, but it is readily detectable via reaction products with air; UDMH is detectable in pure form. The second derivative spectrometer is unlikely to be made hand portable because of the required high detection sensitivities. The design of a fixed base installation of somewhat higher sensitivity is relatively simple to produce. Theory and characteristics of a second derivative spectrometer are discussed. (Author abstract modified)

60226 APTIC NO. 76035

Yankovskiy, I. A.

EXPERIENCE OF AN AIR POLLUTION OBSERVATION NETWORK. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 3 refs. Translated from Russian, 5p.*

The creation of a network of stationary posts for monitoring atmospheric pollution in industrialized urban areas is discussed. Some agencies propose only 5 stationary posts for the air basin of a city of any size: one in the city center, one on the periphery supposedly away from effects of industrial emissions, one close to industrial sources, one close to heavily traveled highways, and one near green vegetation that is not exposed to industrial emissions. Critics of this scheme note that it is difficult to find places reliably free from industrial pollution under the complex and variable conditions of diffusion in urban air. A new design for stationary posts with instruments for remote measurement of wind speed and direction, air temperature, and humidity is described. A new, relatively portable electrocalorifier has been developed for taking air samples at low air temperatures. It can be used temporarily where standard pavilions have not yet been installed. Spruce trees, pine trees, lichens and algae have been used as bioindicators of air pollution in Leningrad.

60227 APTIC NO. 75908

Yoshimori, Takayoshi and Makoto Nonomura

DIFFERENTIAL DETERMINATION OF SULFUR DIOXIDE AND SULFURIC ACID MIST BY USING HEATED SODIUM CHLORIDE. *Bunseki Kagaku (Japan Analyst) (Tokyo), vol. 23:356-364, 1974. 40 refs. Translated from Japanese, 21p. (Presented at the Japan Analyst Society, Annual Meetings, 20th and 21st and at the Japan Chemical Society, Spring Meeting, 28th.)*

A method for the differential determination of sulfur dioxide and sulfuric acid mist in flue gas is described. The method is based on the selective reaction of heated sodium chloride with sulfuric acid mist to produce hydrogen chloride, resulting in a 90.4% conversion of the mist as compared to a 3.3% conversion of the SO2 at 500 C. Absorption of the mist is accomplished with an aqueous solution of 1% hydrogen peroxide and an electrostatic precipitator. Successful determinations of H2SO4 mist and SO2 in flue gases from an ore sintering furnace and a water boiler were accomplished.

60228 APTIC NO. 76025

Zaytsev, A. S. and V. I. Anufriev

STATISTICAL ANALYSIS OF RESULTS OF INTERNATIONAL COMPARISONS OF AUTOMATIC GAS ANALYZERS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 1 ref. Translated from Russian, 11p.*

The dynamic characteristics of four automatic recording sulfur dioxide gas analyzers were compared in laboratory and field tests: a modified Novak sulfur dioxide gas analyzer and a Barmbt MO-DK analyzer from East Germany; a sulfur dioxide gas detector manufactured by Palmer (England) from Bulgaria; a GKPrl gas analyzer from the USSR; a Novak gas analyzer (type 641) and a Kolugraf from Czechoslovakia. Excepting the Palmer, each operates by the reaction of sulfur dioxide with iodine, forming hydrogen iodide. Stability of the null line and the readings, reproducibility of the readings, time lag for the start of the recording, time to establish readings, and time for discharge to zero were determined in the laboratory. Transfer functions were studied and compared. Measurements were taken with the instruments in the ambient air. A comparison of the spectral functions and the mean concentrations indicates that the instruments give comparable results, within the limits of their accuracy.

60229 **APTIC NO. 76590**

ANALYTICAL METHODS FOR USE IN OCCUPATIONAL HYGIENE. *Pure Appl. Chem., 40(3):34/1-41/2, 1974. 27 refs.*

Methods are described for determining eight substances in air. Appropriate sampling methods are included. Vanadium, lead, and cadmium in airborne particulates are determined by atomic absorption spectrophotometry. To measure benzo(3,4)pyrene and benzo(k)fluoranthene, airborne particulate matter is collected on suitable filters, the organic material is extracted with a suitable solvent, and fluorescence measurements are made on chromatographed fractions. Hydrogen chloride vapor is measured by colorimetric determination of the products of a chemical reaction with the vapor dissolved in water. This method is capable of measuring hydrogen chloride concentrations in air in the range of 2.5 to 15 ppm. Analytical procedures and fields of application are included for each substance. Performance standards for detector tubes are also discussed. Recommendations are made for two types of detector tubes: those which measure the concentration by the length of stain developed when a measured volume of air is drawn through the tube, and those where the air sample produces an overall change in the color of the contents of the tube. The performance of a tube should be assessed by sampling test atmospheres of known concentration; it is very desirable that the accuracy of these test atmospheres should be confirmed by an independent reliable analytical method.

1973

60230 **APTIC NO. 73599**

Allario, Frank, R. K. Seals, Jr., Philip Brockman, and R. V. Hess

TUNABLE SEMICONDUCTOR LASERS AND THEIR APPLICATION TO ENVIRONMENTAL SENSING. *Preprint, Society of Engineering Science, St. Louis, Mo., 24p., 1973. 30 refs. (Presented at the Society of Engineering Science, Anniversary Meeting, 10th, Raleigh, N. C., Nov. 5-7, 1973, Paper L-8996.)*

The application of tunable lead-selenium diode lasers to remote atmospheric sensing was investigated during experiments designed to identify spectral tuning rates for the laser and demonstrate its capability of making high resolution spectroscopic sulfur dioxide measurements. A magnetic field was used to shift laser modes to the desired spectral region, and current scanning was used to tune across individual absorption lines. The absorption spectrum for SO2 in the region between 1175.00 and 1260.00/cm was experimentally generated, and the magnetic and current tuning rates depended on the current and magnetic field. Although this dependence makes high resolution diagnostics with the laser difficult, accurate tuning rates as a function of current and B-field were measured and used to obtain pressure broadened line widths of SO2. Good agreement with earlier results demonstrated the utility of lead-selenium diodes as high resolution sensors of atmospheric molecules. Theoretical studies are cited to illustrate the application of tunable diode lasers for the quantitative detection of various atmospheric pollutants in the stratosphere and troposphere.

60231 **APTIC NO. 80611**

Baiulescu, G. E. and P. C. Marcuta

FOUR-(4-AMINOPHENYLAZO)-3-METHYL-1-PHENOLYPYRAZOLIN-5-ONE AS REAGENT FOR SPECTROPHOTOMETRIC DISCRIMATION OF ATMOSPHERIC SULFUR DIOXIDE. *(4-Aminofenilazo)-1-fenil-3-metil-pirazol-5-ona ca reactiv pentru determinarea spectrofotometrica a SO2 atmosferic). Text in Roumanian. Rev. Chem. (Bucharest), 24(8): 643-646, 1973. 6 refs.*

A method for determining atmospheric sulfur dioxide, using the above dye in conjunction with ethanol, a KCl-HCl buffer, and formaldehyde, has the following advantages over present procedures: 1) a sufficiently wide absorption band to permit optical measurements; 2) instantaneous appearance of the color and its persistence for a time sufficient to permit optical measurement; 3) obedience to the laws of Lambert, Bouguer and Beer throughout the measurable absorption spectrum; 4) a single reagent can be used throughout. The optimum pH and optimum concentrations of ethanol, dye, and formaldehyde were determined in a series of experiments in which one variable at a time was held constant.

60232 **APTIC NO. 67145**

Benarie, M., A. Grudzinski, and J. P. Quetier

RECENT DEVELOPMENTS CONCERNING THE PRINCIPLE OF PARTICLE DETECTORS USING MECHANICAL OBSERVATION ON THEIR IMPACTION (MICRODYNAMOMETER). *(Developpements recents concernant le principe des detecteurs de particules par observation mecanique de leur impaction (microdynamometre)). Text in French. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany 1973, p. 8-12. 10 refs. (Oct. 17-18.)*

The principle and practical design of microdynamometers for the determination of the mass of aerosol particles by measuring their impaction on a microbalance in a vacuum chamber are described. As the energy generated by a single particle impacting on the microbalance is very small, the kinetic energy of the impaction of a jet of accelerated particles is measured. The particles are accelerated to about 200 m/sec when admitted to the chamber with a vacuum of less than 1 mbar. The amplitude of the displacement of the dynamometric organ can be measured by cathetometer, or by optical, electrostatic, electromagnetic or other methods.

60233 **APTIC NO. 67063**

Birks, L. S.

APPLICATION OF X-RAY FLUORESCENCE TECHNIQUES TO AIR POLLUTION PARTICLES. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):54-55, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

X-ray fluorescence techniques are reviewed in terms of their application to the analysis of airborne particulates. Rapid economical analysis of standard air-filter samples is possible with X-ray fluorescence since no specimen preparation is required and 10-20 elements can be measured simultaneously in less than 2 min time. Detectability depends on the intensity of the characteristic lines of the elements and on the background intensity scattered by the filter substrate. Using one or two min measurements, detectable limits for elements from aluminum to vanadium generally fall in the 1-5 ng/sq cm range; transition elements from iron to zinc fall in the 10-50 ng/sq cm range; and higher atomic number elements where the L series X-ray lines must be utilized may require 100 ng/sq cm or more. Generally, radioisotope sources are not competitive with X-ray tube excitation because even the strongest isotopes yield several orders of magnitude less emission than ordinary

X-ray tubes. A comparison of energy dispersion using best-resolution solidistate detectors with wavelength dispersion using crystal spectrometers shows that either method gives similar single element detectability, though crystal spectrometers give better resolution. Background interference which limits detectability can be greatly reduced by using Millipore or similar material of low mass weight to reduce scattering by the filter substrate.

60234 **APTIC NO. 73472**

Borisov, V. N., A. G. Vitenberg, N. S. Vol berg, V. A. Isidorov, and V. B. Stolyarov

GAS-CHROMATOGRAPHIC DETERMINATION OF AROMATIC HYDROCARBON MICROIMPURITIES IN AIR. *(Opredelenie mikroprimesey aromaticheskikh uglevodorodov v vozdukhe metodom gazovoy khromatografii). Text in Russian. Tr. Gl. Geofiz. Observ., no. 293:89-92, 1973. 14 refs.*

A method for the sampling and quantitative gas-chromatographic determination of aromatic hydrocarbons such as benzene, toluene, and m-xylene in the air is described. Air is sampled at a rate of up to 200 l/min, the sample volume being 2 to 4 l. The aromatic hydrocarbons are adsorbed on silica gel type KSS-4 or S-4 with a grain size of 0.25-0.4 mm. The aromatic hydrocarbons are then eluted with acetic acid for subsequent gas- chromatographic determination with a differential flame- ionization detector. A chromatographic column with cyanoethylated pentaerythrite is used for separation. Quantitative analysis is possible from 0.3 micrograms/ml, while the limit of detection lies at 0.1 mg/cu m for all three compounds.

60235 **APTIC NO. 81082**

Borisov, V. N., A. G. Vitenberg, N. S. Vol berg, V. A. Isodorov, and B. V. Stolyarov

THE DETERMINATION OF TRACE IMPURITIES OF AROMATIC HYDROCARBONS IN THE AIR BY THE METHOD OF GAS CHROMATOGRAPHY. *Tr. Gl. Geofiz. Observ. (Leningrad), no. 293:83-92, 1973. 14 refs.*

A method of analyzing trace impurities of aromatic hydrocarbons with their content in the atmospheric air at the level of the established maximum permissible concentration was developed. A method of sampling with preliminary concentration of the determined compounds was created and chromatographic analysis in the presence of interfering impurities in amounts many times in excess of the components of interest was developed. Air is sampled with a glass tube containing silica gel, and the compounds adsorbed on the silica gel are washed out with acetic acid. Purification of the acetic acid and preparation of the silica-gel are described. Preparation of standard solutions and their use to calibrate the instrument are also described. The conditions of gas chromatographic determination of aromatic hydrocarbons in acetic acid in the presence of other types of compounds were chosen, and a method suggested for determining trace impurities of aromatic hydrocarbons in the atmosphere using commercially available chromatographs. The columns used for chromatographic analysis are described. (Author abstract modified)

60236 **APTIC NO. 80378**

Coloff, Stanley G., Marcus Cooke, Ronald J. Drago, and Stanley F. Sleva

AMBIENT AIR MONITORING OF GASEOUS POLLUTANTS. *Am. Lab., vol. 5:10-16, 18-20, and 22, July 1973. 25 refs.*

The operational theory and applications of ambient air monitoring techniques for sulfur dioxide, carbon monoxide, photochemical oxidants (zone, peroxyacyl nitrates, and nitrogen dioxide), hydrocarbons, and nitrogen oxides are reviewed, with particular emphasis on reference methods. Topics discussed include: colorimetric, conductimetric, coulometric, and flame photometric methods for sulfur dioxide determination; nondispersive infrared carbon monoxide measurements; colorimetric, ultraviolet, and chemiluminescent techniques for photochemical oxidant measurements; gas chromatographic (flame ionization detection) determinations of total hydrocarbons; and chemiluminescent and colorimetric analyses of nitrogen dioxide.

60237 **APTIC NO. 84371**

Confer, Robert G. and Richard S. Brief

EXPERIENCE WITH INDUSTRIAL HYGIENE AND AIR MONITORING EQUIPMENT. *In: Air Quality Instrumentation. Selected Papers from International Symposia presented by the Instrument Society of America. John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 131-138. 19 refs. (Presented at the Instrument Society of America, Mining and Metallurgy Group Symposium and Exhibit, Annual, 2nd, June 11-13, 1973.)*

The need for manufacturers of industrial hygiene and air monitoring equipment to more fully explore the conditions under which a given device is to be used in the field before marketing it is discussed. Commercial monitoring units are generally tested under laboratory conditions by experienced personnel and may not be suitable for continuous field conditions where operating problems peculiar to a specific situation exist. A diaphragm type sampling pump that was approved by the Bureau of Mines for determining coal miner exposure to airborne dust proved to be defective after several years of use because of velocity fluctuations through the sample train cyclone resulting from the pulsed flow characteristic of the pump. Airborne concentrations of respirable dust obtained with the pulsed flow pumps were as much as 30% below the true concentration.

60238 **APTIC NO. 67132**

Coulson, D. M., D. L. Haynes, and M. E. Balazs, and M. P. Dolder

SURVEY OF MANUAL METHODS OF MEASUREMENTS OF ASBESTOS, BERYLLIUM, LEAD, CADMIUM, SELENIUM, AND MERCURY IN STATIONARY SOURCE EMISSIONS. FINAL REPORT. *Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract 68-02-0310, ROAP 26AAG, SRI Proj. PYU-1374, Program Element 1HA327, Rept. EPA-650/4-74-015, 157p., Sept. 1973. 158 refs.*

NTIS: PB 234326

A literature survey and results of laboratory and field testing of manual measurement methods for stationary source emissions of asbestos, beryllium, lead, cadmium, selenium, and mercury are given. Electron microscopy is the method of choice for asbestos, while atomic absorption spectrometry is used for Be, Pb, Cd, and Hg. Selenium is measured using a spectrophotometric method. Each of the manual methods is outlined in terms of principles and applicability, range and sensitivity, interferences, accuracy, precision, stability, sample treatment, reagents and supplies, standards preparation, apparatus parameters, and calibration procedure. The basis sampling device for each method consists of a probe, filter, impingers, meter box, and vacuum pump.

60239 **APTIC NO. 67069**

Dennison, J. Eugene, Robert E. Visco, and Barret Broyde

AIR ANALYSIS: RECENT INSTRUMENTATION STUDIES AND SURVEY EXPERIENCE. *West. Elec. Eng., 17(2):3-12, April 1973. 22 refs.*

Federal, state, and local agencies are requiring information on the concentrations of potential pollutants in and around industrial sites. Along with other manufacturers, Western Electric must be able to measure concentration levels of some materials accurately and systematically. Instruments have been selected when available, and developed when necessary, to make these measurements. Air surveys using these instruments, conducted at Western Electric manufacturing and service locations, have provided information on the value of instrumental air analyses and data on the air quality at company locations. The air surveys have also developed procedures for obtaining future, more comprehensive measurements. The regulations, measurement technology, monitoring methods for various pollutants (sulfur oxides, nitrogen oxides, oxidants, hydrocarbons, carbon monoxide, particulates, chlorinated hydrocarbons, acid gases and mists, and phosphorus and boron gases), and survey experience at Western Electric are reviewed.

60240 **APTIC NO. 67148**

Deworm, J. P., G. Fieuw, A. R. Sundararajan, and S. Berckmans

USE OF A CASCADE CENTRIPETER FOR RESPIRATORY HAZARD EVALUATION. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973. p. 30-34. 37 refs. (Oct. 17-18.)*

The cascade centripeter was used to measure particle size distribution of plutonium particles in an evaluation of respiratory hazards. The degree of aerosol deposition in different regions of the respiratory tract is governed by the size spectrum of the aerosols and their associated aerodynamic behavior. The aerodynamic quality of a dust governs the amount and sites of deposition and indirectly the clearance rate. The evaluation of the inhalation hazards are initiated by calculating the deposition pattern for any given aerosol, which relates deposition in the respiratory tract to the aerodynamic size distribution parameters. The cascade centripeter separates particles according to their aerodynamic properties. Methylene blue aerosols from a spinning disc generator were used to evaluate the performance of the sampler. The P4 samples were subsequently analyzed by autoradiographic methods which indicated attachment of small P4 particles to bigger inactive dust particles. (Author abstract modified)

60241 **APTIC NO. 84352**

Dupeuble, Jacques

UTILIZATION OF NUCLEOMETRIC SULFUR MONITORS IN THE PETROLEUM INDUSTRY. *(Utilisation du sulfurimetre nucleometre dans l industria petroliere). Text in French. Ind. Petrole, vol. 441:39, 41-42, June 1973.*

A nucleometric sulfur monitor works on the basis of X-ray absorption. An American 241 radioactive source eliminates aging problems, and the amount of energy (23 keV) cancels the influence of the hydrogen-carbon interactions on the hydrocarbons under analysis. The sulfur monitor could also be used to control sulfur dioxide emissions from heavy fuel industries such as thermal and refining installations; the concentration of sulfur in the fuel could be measured as the latter is being used for combustion. This method facilitates sampling and flow measurement, and produces data representative of sulfur dioxide emission into the atmosphere.

60242 **APTIC NO. 84390**

Feldman, Josef

CONTINUOUS STACK ANALYZER FOR MULTICOMPONENT ANALYSIS. *In: Air Quality Instrumentation. Selected Papers from International Symposia, presented by the Instrument Society of America, John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 147-154. 2 refs. (Presented at the International Symposium of the Analysis Instrumentation Division of the Instrument Society of America, 19th, April 24-26, 1973.)*

A continuous stack analyzer for the multicomponent analysis of gaseous emissions is described. The analyzer employs dual beam optics, using either an infrared source or an ultraviolet source. The simultaneous monitoring of two gases is possible since the analyzer contains two detectors which provide two equivalent optical channels for analysis. Energy from a regulated heated filament source is focused into two beams, one of which passes through a cell in which the gas samples flow and a second beam which is a reference cell. Each beam is passed and reflected intermittently by a rotating chopper and is then focused through an optical filter and cone optics onto a radiation detector consisting of a matched pair of thermistors connected in a bridge circuit on a common substrate. The output of the analyzer is a direct current signal proportional to the number of absorbing molecules in the sample cell and is insensitive to changes in the gas flow rate. Typical measurement ranges are shown for carbon dioxide, hydrocarbons, hydrogen sulfide, nitric oxide, nitrogen dioxide, and sulfur dioxide. A sampling system which removes particulates in the gas stream to be analyzed is also described.

60243 **APTIC NO. 67150**

Gebhart, J. and C. Roth

PARTICLE SIZING BY MEANS OF SMALL ANGLE SCATTERING IN THE LIGHT BEAM OF A MERCURY LAMP. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 41-44. 39 refs. (Oct. 17-18.)*

The development of optical size spectrometers for the measurement of particles above 1 micron is discussed. The resolution power of the instruments can be improved so that particles differing only a few percent in size can be distinguished. The main elements of a high resolution instrument are a suitable calibration curve and the aerodynamic focusing of the aerosol flow, the latter of which leads to constant flow velocities and homogeneous illumination of the particles in the sensing volume. Two instruments are needed to cover the size range between 0.5 to 5 micron. For particles smaller than 0.15 micron a laser of 1 Watt output is needed. Below the wavelength the calibration curve is monotonically increasing at any scattering angle. A mean scattering angle of 30-40 degrees should be used to eliminate the stray light. Above the wavelength the detection of particles is no longer a question of the scattered light intensity and of the stray light background. The scattering angle and the receiver aperture can be selected so that a suitable calibration curve is obtained and the influence of the particle material on the response is minimized.

60244 **APTIC NO. 84318**

Gordon, G. E., E. S. Gladney, J. M. Ondov, T. Conry, and W. H. Zoller

PROBLEMS WITH THE USE OF CASCADE IMPACTORS. *National Science Foundation, Washington, D. C., Trace Contam. Conf., Annu., 1st, Oak Ridge, Tenn., 1973, p. 138-145. 5 refs. (Aug. 8-10.)*

Problems involved with the use of cascade impactors for particle size determination studies are discussed, and results of collection efficiency studies with three different types of impactors are reported. Factors that can contribute to experimental artifacts when cascade impactors are used for particle collection include wall losses and particle bounce-off followed by reentrainment and deposition of the particles on later impactor stages. Side-by-side comparisons of a Lundgren impactor, a Scientific Advances impactor, and a modified Andersen sampler revealed that the Scientific Advances impactor possessed the highest collection efficiency and the least amount of bounce-off. The modified Andersen impactor produced slightly more distortion, and the Lundgren impactor exhibited serious bounce-off effects especially for particles bearing aluminum. (Author abstract modified)

60245 **APTIC NO. 67147**

Guichard, J. C., and C. Chauvelier

NEW METHOD FOR THE CONTINUOUS MEASUREMENT OF DUST CONCENTRATIONS. *(Nouveau procede de mesure en continu de la concentration en poussieres de particules solides). Text in French.*

Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 20-29. 4 refs. (Oct. 17-18.)

A new Jetimeter instrument for the determination of high concentrations of solid, dry particles in hot industrial waste gases based on the principle of triboelectricity is described. The dust-laden hot gas to be analyzed is sucked through a lower Faraday cage (spouted bed) with hemispheric bottom containing bronze balls 315-400 micron in diameter and with a jet inlet in its bottom center, and subsequently through a series-connected top stage containing a bed of zinc granules 400-500 micron in diameter. The top stage, serving for the determination of the triboelectric charge entrained by the dust particles from the Faraday cage, is electrically insulated from the latter. The weight concentration of the dust is a linear function of the potential measured. The Jetimeter is suitable for use up to 300 C temperature and for dust concentrations of up to 200 mg/cu m.

60246 **APTIC NO. 76212**

Habel, Karl

MEASURING TECHNIQUES FOR DETERMINATION OF FLUORINE CONTENT OF AIR AND STACK GASES. *(Derzeitiger Stand der Messtechnik zur Bestimmung des Fluorogehaltes in Immissionen und Emissionen). Text in German. Arch. Eisenhuettenw., 44(9):697-702, 1973. 7 refs.*

Recent measuring techniques for and problems involved in the measurement of gaseous and particulate fluorine concentrations in the air and in stack gases are reviewed. It is possible to determine the total fluorine content in the air by sampling with impinger or sorption tube filled with sodium carbonate-coated silver spheres. These methods do not permit, however, the separation of gaseous and particulate fluorine. Gaseous fluorine can be sampled in such sorption tubes after the air is passed through a dust separator. Gaseous and particulate fluorine can be separated in a more or less satisfactory manner by the membrane filter method using a heated filter, combined with impinger or sorption tube. Filtration through silica wool is suitable for the sampling of gaseous fluorine compounds in stack gases in a concentration range of up to 200 mg/cu m. There is no reliable procedure for the exact separation of gaseous and solid fluorine compounds. Gaseous fluorine compounds can be determined at an accuracy of 10-15%, while solid fluorine compounds can be determined on the basis of the dust measurement.

60247 **APTIC NO. 67160**

Hauck, H. and K. Holzer

ELEMENT-SPECIFIC EVALUATION OF CASCADE IMPACTOR AND CENTRIFUGE SAMPLES BY ATOMIC ABSORPTION SPECTROMETRY. *(Elementspezifische Auswertung von Kaskadimpaktor- und Zentrifugenproben mittels Atomabsorptionsspektrometrie). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 86-88. 1 ref. (Oct. 17-18.)*

A method for the determination of individual elements in aerosol samples taken by means of cascade impactor and centrifuge by atomic absorption spectrometry is described. The aerosol sample captured is placed in a graphite tube which is then heated electrically to atomize the sample. Monochromatic light from a hollow-cathode lamp is sent through the graphite tube in an axial direction for measurement by means of a light-sensitive detector. Elements whose emission line is emitted by the hollow-cathode lamp absorb this line whereby an absorption signal is obtained. The graphite tube is also suitable for the analysis of originally liquid samples. Direct incineration and analysis in the graphite tube is only possible when thermal incineration is impossible, and when there are no interfering matrix effects. The sensitivity of the atomic absorption spectrometry amounts to 1-100 picogram. Lead, manganese, beryllium, nickel, and cobalt were analyzed by this method in aerosol samples.

60248 **APTIC NO. 83451**

Heros, Marguerite and Lucien Mallet

DETERMINATION OF PYRENE IN VAPORS EMITTED DIRECTLY BY ATMOSPHERIC DUSTS AND DIVERSE PRODUCTS BY UV-ABSORPTION SPECTROPHOTOMETRY. *Dosage du pyrene par spectrophotometrie d absorption U.V. dans les vapeurs emises directement par les poussieres atmospheriques et divers produits). Text in French. Analusis, 2(3):176-178, March 1973. 6 refs.*

An apparatus for ultraviolet absorption spectrophotometry, consisting of a quartz absorption tube with two lateral tubes, one of which contains a dust sample while the other is used to establish a vacuum, is described. A potentiometer continuously varies the temperature in the tubes. The dust is heated to a temperature gradient slightly higher than that of the entire tube complex. There is no cold equipment during the sampling, so that each hydrocarbon at each temperature rise will be in equilibrium with its saturating vapor. Optical densities for pyrene ranging from 300 to 355 nm were measured until the density stabilized for a band with a maximum of 337.0 nm. Anthracene, fluorene, chrysene, benzo(3,4)pyrene, and coronene are also being studied.

60249 **APTIC NO. 67058**

Hinkley, E. D. and A. R. Calawa

POLLUTANT MONITORING WITH SEMICONDUCTOR DIODE LASERS. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):19-22, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

A review is presented on pollutant monitoring applications of semiconductor diode lasers. Diode lasers are available with wavelengths matching strongly-absorbing infrared regions of such gases as carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, ozone, ammonia, and ethylene, as well as water vapor. The ability of the lasers to be tuned alternately on and off a pollutant gas absorption line permits diode lasers to minimize some of the problems encountered with other optical monitoring techniques. Basic types of measurements well suited to tunable laser techniques include: resonance absorption, differential absorption and scattering, resonance fluorescence, and remote heterodyne detection. Examples are given for point sampling of SO2, C2H4, and NO, in situ source monitoring of C2H4, and ambient air monitoring of C2H4. The greatest obstacle to wider application of semiconductor diode lasers is their requirement for cryogenic cooling.

60250 **APTIC NO. 67086**

Hinkley, E. D. and A. R. Calawa

DIODE LASERS FOR POLLUTANT MONITORING. *Preprint, American Chemical Society, Washington, D. C., 27p., Oct. 23, 1973. 6 refs. (Presented at the American Chemical Society, National Meeting, 165th, Dallas, Tex., April 1973.)*

Because of their small size, ruggedness, and simplicity of operation, semiconductor diode lasers have been considered for a wide variety of gaseous detection applications, from point sampling to ambient air quality measurements. Diode lasers from various compositions of semiconductor materials emitting in the 4-12 micron region of the infrared have been used to measure characteristic absorption of gases such as carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, oxygen, ammonia, ethylene, and formaldehyde. The application of diode lasers to ambient air and source monitoring by infrared absorption and examples from experiments which have been performed are described. Some of the engineering obstacles which must be overcome before the use of these devices can become widespread are discussed. Experimental results are presented for detection of ethylene across a parking lot, ethylene detection in automobile exhaust, and sulfur dioxide detection in a coal-burning power plant stack.

60251 **APTIC NO. 67094**

Hinkley, E. D.

DETECTION OF AIR POLLUTANTS WITH TUNABLE LASERS. *Proc. Eur. Elec.-Op. Mkts. Technol. Conf., 1st, Geneva, Switzerland, 1972, p. 24-33, 1973. 28 refs. (Sept. 13-15.)*

A number of tunable infrared lasers and techniques using them for the detection and monitoring of gaseous air pollutants are described. Recent progress in the development of lasers that can be matched to characteristic infrared absorption or emission lines of certain pollutants suggests wide potential application for sensitive, specific monitoring. Examples are given for highly specific point sampling, in situ source monitoring, ambient air monitoring, resonance fluorescence, and remote heterodyne detection. The tunable lasers discussed and their approximate range of coverage include: organic dye lasers (0.34-1.2 micron), parametric oscillators (0.5-3.75 micron), semiconductor diode lasers (0.63-34), spin-flip Raman lasers (53-6.2 (carbon monoxide) and 9.2-14 (carbon dioxide)), bulk semiconductor lasers (optically pumped) (0.32-34), and high-pressure gas lasers (electron-beam pumped) (4.8-8.5 (CO) and 9.1-11.3(CO2)). (Author abstract modified)

60252 **APTIC NO. 81976**

Hryniewicz, R.

DETERMINATION OF HYDROGEN SULFIDE IN ATMOSPHERIC AIR. *(Oznaczanie siarkowodoru w powietrzu atmosferycznym). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(6):8-16, 1973. 9 refs.*

NTIS: TT 73-54096/6

An optimal method for the colorimetric determination of hydrogen sulfide in atmospheric air is described. A solution of zinc acetate with sodium acetate is used for absorbing the H2S. A selective filter is used for totally absorbing sulfur dioxide and letting H2S pass. The zinc sulfide which forms in the washer is stable, and sampling of air can be continuous for 24 hr, resulting in determination of average concentration for a 24-hour period from one sample. A concentration of 1 microgram H2S/cu m of air can be detected for 24-hour average samples for samplings of 2.5 cu m of air. A content of 3 microgram H2S/cu m of air can be determined for 20-minute samples with samplings of 80 cu cm of air.

60253 **APTIC NO. 70222**

Iverach, D.

INSTRUMENTATION FOR MOTOR VEHICLE EXHAUST TESTING AND IMPLICATIONS FOR LEGISLATION IN N.S.W. *Clean Air Society of Australia and New Zealand, New South Wales Branch, Air Pollut. Control Instrum., Proc. Symp., Sydney, Australia, 1973, p. 2-1 to 2-9. 5 refs. (Sept. 18, Paper 2.)*

The requirements of a motor vehicle exhaust testing procedure are outlined which may vary depending on the local problem. Because Sydney, Australia, is confronted with both city-center carbon monoxide pollution and area-wide photochemical pollution more sophisticated equipment must be used than in European countries where the major problem is CO pollution only. The U. S. analytical techniques and test procedures appear eminently suitable for use locally, and were recommended for use after 1976. However, to relate projected emission reductions achieved by the 1973 U. S. standards (using U. S. data) to the probable reductions in Australia, the effect of different driving conditions in the two countries must be evaluated. Analytical and sampling techniques for CO, hydrocarbons, and oxides of nitrogen are reviewed. (Author abstract modified)

60254 **APTIC NO. 84430**

Jenkins, Robert D.

POTENTIAL UTILIZATION AND DISPOSAL OF PARTICULATE MATERIALS CAPTURED FROM A SILICON METAL FURNACE. *American Inst. of Mining, Metallurgical, and Petroleum Engineers, Electr. Furn. Conf. Proc., 31st, Cincinnati, Ohio, 1973, p. 70-72. (Dec. 5-7.)*

The collection of particulate materials captured from a silicon metal furnace is described. The multiclone dust is collected at the rate of 900 lb/hr, continuously discharging into a covered dump truck. Multiclone dust is the coarse carbonaceous material which settles out from the hot gases in the cooling coils prior to their entry into the bag house. Silica fume is collected at the rate of 1900 lb/hr and is discharged into a silo type bin. Silica fumes contain 94-96% amorphous silica.

60255 **APTIC NO. 84372**

Johnson, Neal E.

A DEDICATED, COMPUTER OPERATED DATA TELEMETRY AND PROCESSING SYSTEM FOR AIR POLLUTION MONITORING AGENCIES AND INDUSTRY. *In: Air Quality Instrumentation. Selected Papers from International Symposia presented by the Instrument Society of America. John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 278-292. 1 ref. (Presented at the Symposium of the Analysis Instrumentation Division of the Instrument Society of America, Annual, 19th, April 24-26, 1973.)*

A computer operated data telemetry and processing system for air quality monitoring applications is described. The system collects and processes air quality data from a number of remote monitoring sites connected to a central station via dedicated telephone lines. The data collected by the system are routinely checked for validity, corrected for instrument drift, searched for alarm conditions, averaged over various terms, formatted into a variety of reports, and stored on magnetic tape. Operation on a 24 hr/day, 365 day/yr virtually unattended basis is possible. Instructions for operation modification can be manually entered at any time. Total program input and additions or modifications to the program are made through a teletype keyboard in the form of multi-word commands. The main program is prepared on paper tape and read into the processor through a teletype paper tape reader.

60256 **APTIC NO. 81839**

Kuyatt, C. E., R. J. Celotta, and S. R. Mielczarek

APPLICATION OF ELECTRON SPECTROSCOPY TO AIR POLLUTION MEASUREMENTS. *Inst. of Physics, Beograd (Yugoslavia). In: The Physics of Electronic and Atomic Collisions. Invited Lectures and Progress Reports, VIII ICPEAC, p. 681-701, 1973. 14 refs.*

An electron spectrometer designed to analyze gaseous air pollutants is described. The basis for the technique is the fact that the energy loss spectrum of electrons of an initially monoenergetic electron beam encountering a gas target is a fingerprint of the atom or molecule of interest. The instrument consists of a Pierce type diode electron gun operated in the temperature-limited emission region of its cathode, a three-lens system containing two sets of four quadrant deflection plates, a monochromator which is normally operated at a center potential of 11 volts and an energy resolution of 1000, three more lenses and two more sets of deflectors, a gas scattering cell, and a monochromator-analyzer. The entire gas building system is constructed of stainless steel tubing and all-metal valves to minimize contamination and wall effects. Energy loss spectra are illustrated for nitrogen, carbon monoxide, water vapor, carbon dioxide, and oxygen. Analytical results are also presented for hydrocarbons in helium ranging in concentration from 9.8-103 ppm.

60257 **APTIC NO. 84351**

Lakatos, Istvan

DETERMINING THE METAL CONTENT IN HYDROCARBONS BY SPECTRAL ANALYSIS. *(Szenhidrogenek femtartalmanak meghatarozasa szinkepelemzessel). Text in Hungarian. Banyasz. Kohasz. Lapok - Foldgaz, 6(4):115-120, April 1973. 27 refs.*

An improved method for the quantitative determination of metals in hydrocarbons by spectral analysis is descried. The method is based upon the use of a rotary disc, and of chloroform-diluted samples in the presence of cobalt. Depending on the metal analyzed, the sensitivity amounts to 0.05-0.5 micrograms. The relative error is 4-6%. The method is suitable for routine analysis. The nickel, vanadium, iron and copper content measured in certain domestic crudes are 2.5-20 ppm, 20-120 ppm, under 3 ppm, and 1-8.4 ppm respectively.

60258 **APTIC NO. 84450**

Lauwerys, R., J. P. Buchet, and H. Roels

BIOLOGICAL CONTROL OF EXPOSURE TO SOME INDUSTRIAL SOLVENTS. *(Controle biologique de l exposition a quelques solvants industriels). Text in French. Louvain Med., vol. 92:1-10, 1973. 33 refs.*

To determine benzene exposure in working conditions, the urine phenol test is recommended. It is sufficiently sensitive, and the concentration of phenol increases significantly for exposures far lower than the accepted concentration of benzene in the air (200 ppm); the gas chromatographic method of determination is also very specific. The urine hippuric acid and urine methyl hippuric acid tests should be used to measure toluene and xylene respectively. By chromatography it can be determined that an exposure of 200 ppm of toluene will produce an average urinary excretion of hippuric acid of 5.85 g/l and an exposure to 130 ppm of xylene an excretion of about 2.63 g/l of methyl hippuric acid. Styrene is detected by the urine phenylglyoxylic acid test. The excretion of this acid will significantly increase following exposure to concentrations inferior to tolerance limits (100 ppm). Trichloroethylene is detected through urine trichloracetic acid and trichlorethanol. The concentration of trichloracetic acid in the urine should not exceed 300 mg/l, which is equivalent to an atmospheric exposure of 100 ppm (tolerance limit). A sodium nitride test will detect carbon disulfide. If normal results are obtained before and after a day of work, then the individual has not been exposed to more than the average tolerance limit of 20 ppm. The solvents are metabolized in the organism. It is thus necessary to collect the urine during the exposure period or within a few hours after the end of the exposure.

60259 **APTIC NO. 84145**

Leichnitz, Kurt

GAS DETECTOR TUBE METHODS AND THEIR DEVELOPMENT. *(Das Pruefroehrchenverfahren und seine Entwicklungstendenzen). Text in German. Chemiker-Ztg. (Heidelberg), 97(12):638-643, 1973. 7 refs.*

The search for suitable dye reactions has led to research for better gas detector tubes, in which color changes are an important condition in the use of reagents. Criteria for evaluating the reagent systems of gas detector tubes include discoloration intensity: recognition of the end product in discoloration (sharp, diffuse, indeterminable); calibration curve of discoloration length and gas concentration; and changes in indicator sensitivity during two years of use. Evaluations also take into consideration cross-sensitivity, i.e., interferences from other substances, with other gases and vapors. This may be corrected by use of selective absorbents in conjunction with selective detectors. Future applications envisage monitoring of industrial air during a work shift and assistance in laboratory and field experiments as well as the determination of suspended matter (oil mist, H2SO4, lead particles).

60260 **APTIC NO. 83009**

Linford, G. J.

NOBLE GAS LASERS FOR AIR POLLUTION MONITORING. *In: Noble Gases. Richard E. Stanley, A. Alan Moghissi, and Jerry J. Lorenz (eds.), p. 561-579. 15 refs. (Presented at the Noble Gases Symposium, Las Vegas, Nev., Sept. 24-28, 1973.)*

Experiments were conducted in three major areas: laser source development, spectral tuning experiments, and pollutant absorption experiments. The first area is emphasized. A simple, relatively compact noble gas laser device was constructed to automatically exclude those noble gas laser lines requiring an elaborate apparatus. Experiments were conducted in which noble gas pressure and discharge parameters were systemically varied, and the number, wavelengths, and output powers of the noble gas laser lines obtained were carefully measured. These experiments were restricted to argon, krypton, and xenon. Some 80 noble gas laser lines were obtained. Some 18 of these were previously unreported. Many of these 18 new laser lines fall in or near important pollutant absorption bands and lines. A substantial number of the 80 noble gas laser lines obtained have adequate optical gains and output powers for air pollution monitoring applications when operated in the pulsed mode. The spectral tuning experiments showed that a high-gain xenon laser can be tuned using the Zeeman effect over as much as 10 A with applied magnetic fields of six kilogauss. High-gain noble gas laser lines can be tuned using the Zeeman effect into coincidence with absorption lines of selected pollutant gases. (Author abstact modified)

60261 **APTIC NO. 84363**

Marcote, Roland V.

A NEW APPROACH TO SAMPLE PREPARATION IN MULTI-PARAMETER TURN-KEY SYSTEMS FOR PROCESS CONTROL AND STACK MONITORING. *In: Air Quality Instrumentation. Selected Papers from International Symposia, presented by the Instrument Society of America, John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 293-304. 9 refs. (Presented at the Instrument Society of America Conference and Exhibit, Annual, 28th, Oct. 15-18, 1973.)*

A diffusion controlled sampling module for multi-parameter process control and stack monitoring is described. The heart of the sampling module is a diffusion chamber which is divided into two sections by a thin polymeric film. A carrier gas is passed through an upper compartment, while the sample is passed through a lower compartment. A selective permeation process occurs as a result of the concentration gradient of the pollutants in the sample and in the carrier gas. A function selector valve allows sample gas, zero gas, and one or two calibration gases to be sent to a multi-parameter monitoring module through the diffusion chamber. The sample is maintained at a temperature above its dew point and is thus preserved in-situ. Water-soluble sample components are not lost since no condensation of water occurs in the sampling system. The sample reaching the analyzer is basically dry because of the low diffusion rate of water through the membrane; hence, the analyzer provides dry-value readings. Linearity and sensitivity data are presented for sulfur dioxide and nitrogen oxide sampling tests.

60262 **APTIC NO. 67061**

McClenny, W. A., W. F. Herget, and R. K. Stevens

A COMPARATIVE REVIEW OF LONG PATH ABSORPTION METHODS FOR AMBIENT AIR POLLUTANTS. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):41-50, 1973. 10 refs. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

Long path absorption methods are comparatively reviewed in relation to their value for monitoring ambient air pollutants.

Scanning spectrometers with continuum light sources and telescopic optics are used to gather data on various pollution sources and to select optimum wavelength regions for the analysis of specific pollutants. A Fourier-Transform Spectrometer is also available and provides spectra at much faster rates and with higher spectral resolution than grating spectrometers of similar cost. The FTS data are obtained in a form suitable for immediate computer analysis, though the computer programs and fundamental spectroscopic data required for real time read-out of concentrations of a wide variety of pollutants do not presently exist. The cost of such a multipollutant system may be prohibitive when compared with some of the less versatile but simpler laser and nondispersive infrared techniques. The Barringer Correlation Spectrometer, which modulates the spectra at the focal plane of a fixed grating monochromator with a correlation mask to produce a signal proportional to concentration, is available for measuring nitrogen dioxide and sulfur dioxide concentrations over long paths. Two types of laser systems receiving attention for long path absorption applications are a carbon dioxide laser and a tunable diode laser. The former has the drawback of large size, while the latter requires that the diodes and detectors be cryogenically cooled. A nondispersive infrared long path system is to be evaluated in the future.

60263 **APTIC NO. 67153**

Moenig, F. J. N. Schwarzer, and W. Stoeber

DETERMINATION OF THE AEROSOL MASS DISTRIBUTION IN AN AEROSOL CENTRIFUGE BY MEANS OF OSCILLATOR CRYSTALS. *(Bestimmung der Aerosol-Massenverteilung in einer Aerosol-Zentrifuge mit Hilfe von Schwingquartzen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 58-61. 8 refs. (Oct. 17-18.)*

Laboratory experiments concerning the determination of the mass distribution of a fluorescein aerosol by a combination of Stoeber s centrifuge at 3000 rpm and oscillator quartz crystals for layer weighing is described. The quartz crystals were placed on a strip of copper-laminated paper on the rotor cover. A Pierce- Colpitts circuit was used for the oscillator to avoid reaction with the crystals. The frequency increased with the thickness of the aerosol deposit as a function of time. The error of the microbalance method was 2.3%.

60264 **APTIC NO. 79262**

Niediek, Ernst Adolf

RAPID METHOD OF PARTICLE SIZE ANALYSIS. II. APPLICATION AND PROCEDURE; III. SIMPLE PHOTOMETER. *(Schnellmethode zur Korngroessenanalyse. Teil II: Anwendung und Durchfuehrung. Teil III: Einfaches Fotometer). Text in German. Verfahrenstechnik, 7(9):280-286, 1973. 5 refs.*

A simple and rapid photometric method for particle size analysis is described. The particles to be analyzed are suspended in water or another medium with low viscosity in a cuvette, and the extinction is measured by means of a photometer against a blank sample. This method permits a more rapid determination of wet-sieving residues than does gravimetry. The photometric method permits the relatively simple automation of wet-sieving analysis for laboratory use, production control, and the regulation of milling plants. The photometer must, however, be calibrated for any particular type of matter. Therefore, this method is particularly suitable for routine analyses of the same species.

60265 **APTIC NO. 84471**

Nucciotti, F. and G. Simonini

AIR POLLUTANT SAMPLING BY MEANS OF POTASSIUM CARBONATE FILTERS EXPOSED AT A SHELTERED SITE. *(Echantillonage de polluants atmospheriques par filtre au K2CO3 exposes dans abris meteorologiques). Text in French. World Meteorol Organ./World Health Organ., Tech. Conf. Observ. Measurement Atmos. Pollut., Helsinki, Finland, 1973, p. 363-369. 9 refs.*

NTIS: N75-11476-540

A simple and inexpensive method for air sampling for the subsequent chemical analysis of air pollutants by means of potassium carbonate filters is described. Air is sampled by means of exposed cellulose filters imbued with potassium carbonate solution and dried. The filters are exposed at a sheltered site for up to 30 days, and substantially less in areas with low overall pollution levels. Following exposure, the filters are subjected to chemical analysis of air pollutants, such as oxides of nitrogen and sulfur, hydrogen sulfide, fluorine compounds, and practically all acid compounds. The sampling method is especially suitable for the determination of averaged concentrations, and even in areas with low air pollution levels.

60266 **APTIC NO. 84387**

Payne, J. S.

USE OF AUTOMATED X-RAY FLUORESCENCE ANALYSIS IN AIR POLLUTION CONTROL. *In: Air Quality Instrumentation. Selected Papers from International Symposia, presented by the Instrument Society of America, John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974. p. 168-178. 6 refs. (Presented at the Symposium of the Analysis Instrument Division of the Instrument Society of America, Annual, 19th, April 24-26, 1973.)*

The use of automated X-ray fluorescence for the analysis of large numbers of air pollution filter samples is discussed. Tube excited wavelength dispersive systems provide superior detection for the elements from potassium on down, whereas radioactive source energy dispersive systems are as good or better for calcium and above. Systems which combine X-ray tube excitation with an energy dispersive detector are also in commercial use. Analytical results supplied by manufacturers of X-ray fluorescence instruments are presented for phosphorus, sulfur, chlorine, potassium, calcium, iron, nickel, copper, zinc, arsenic, cadmium, bromine, barium, and lead.

60267 **APTIC NO. 67060**

Richards, L. Willard

A NEW TECHNIQUE TO MEASURE SULFURIC ACID IN THE AIR. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):40-40a, 1973. 1 ref. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

A technique is described for the measurement of sulfuric acid in air. Ambient air is drawn through a filter in a first step to collect the aerosol particles and hence the H2SO4, while in a second step the H2SO4 is volatilized by warm dry air. The amount of acid volatilized is measured with a flame photometric detector. The H2SO4 collected in one cycle of the monitoring system is volatilized in the following cycle so that a continuous record of the average concentration is obtained. The monitoring method detects only sulfur containing compounds which are in the particulate phase under ambient conditions and which vaporize when dried and warmed; hence, interferences are not expected to be a problem.

60268 **APTIC NO. 67149**

Roth, G. and J. Gebhart

COMMENTS TO THE LOWER DETECTION OF A LASER AEROSOL SPECTROMETER. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 36-40. 38 refs. (Oct. 17-18.)*

The measurement of aerosols with a laser aerosol spectrometer and the determination of its lower detection are discussed.

Instruments using the light scattered by a single particle are advantageous because the analysis of a highly concentrated aerosol of airborne particles is possible. If a spectrometer is designed for high resolution power or the measurement of highly concentrated aerosols, for independence of the response of the particle material or for a very low detection limit, a general arrangement is no longer feasible. False light and the scattering of the molecules inside the total scattering volume produce noise at the photomultiplier output. This noise may determine the lower detection limit of the instrument. To determine the present false light and molecule scattering in the instrument two different experiments were conducted. The calibration curve of an argon laser spectrometer shows the lower detection limit of the instrument can be placed to a particle size of 0.05 micron.

60269 **APTIC NO. 50206**

Schippel, M. and J. Otto

CONTINUOUS AIR SAMPLING IN GAS COLLECTION VESSELS WITH THE AIR OF CRITICAL NOZZLES. *(Kontinuierliche Luftprobennahme in Gassammelgefassen mit Hilfe kritischer Duesen). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 19(2):106-108, 1973. 5 refs.*

The suitability of the critical nozzle for continous air sampling in evacuated gas collection vessels for gas chromatographic determination of solvents was studied. Critical nozzles with a diameter of less than 0.05 mm were made, for which a glass capillary with a lumen of 1 mm was used. The nozzles were calibrated with a suds flow meter which operates with far greater accuracy than precision gas meters. The pressure compensation is illustrated as function of the time. The curve is a straight line to about 3/4 of the external air pressure. At this point, the gas collection vessel is 75% full. At the filling of the remaining 25%, the linear relationship is lost. The curves approach asymptotically the value of the external pressure. Satisfactory results were obtained with the nozzle. A preceding filter with a filtering area of 1 sq cm prevents the nozzle from clogging.

60270 **APTIC NO. 79799**

Siekierzynska, Halina

RECENT STUDIES ON METHODS FOR THE DETERMINATION OF NITROGEN DIOXIDE IN THE AIR. *(Wyniki ostatnich badan metod oznaczania dwutlenku azotu w powietrzu atmosferycznym). Text in Polish. Ochrona Powietrza (Warsaw), 7(5):135-140, Oct. 1973. 5 refs.*

Recent literature is surveyed and investigations performed by various researchers in order to eliminate uncertainties and errors from Jacobs-Hochheiser (J-H), Griess-Illosvay (G-I), and Saltzman colorimetric methods for determination of nitrogen dioxide in the air are extracted and described. The work of L. J. Purdue resulted in a conversion factor of approximately 1 for the determination of NO2 concentration in the air from concentration of NO2 ions in the solution. The weak absorptive capabilities of sodium hydroxide (up to 35%) have been verified. The work of P. Bourbon on Saltzman's method resulted in a determination of the conversion factor as a function of nitrogen dioxide concentration in the air. The values of this factor range from 1.0 to 0.5 for a range of NO2 concentrations from 2.5 to 550 mg/cu m. The amount of error resulting from reduction of NO2 and from other side reactions in Saltzman solution has also been determined. A comparison of the three methods shows that the stability of samples in the J-H and G-I methods is high but only the sampling procedure can be automated. Samples obtained by Saltzman method are unstable and must be analyzed immediately, but the process can be fully automated.

60271 **APTIC NO. 84426**

Siekierzynska, H.

RESULTS OF THE LATEST TESTS ON METHODS FOR DETERMINING NITROGEN DIOXIDE IN ATMOSPHERIC AIR. *(Wyniki ostatnich badan metod oznaczania dwutlenku azotu w powietrzu atmosferycznym). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(5):14-24, 1973. 5 refs.*

NTIS: TT 73-54096/5

Methods for determining nitrogen dioxide in the atmosphere are described. The reaction on the formation of chromatic diazo compounds of sulfanilic acid with naphthylamines, taking place under the influence of NO2, constitutes the basis for the most frequently used method for determining nitrogen oxides in the air or in emitted gases. The Saltzman method, in contrast to the Griess-Ilosvay method and Jacobs-Hochheiser method, shows high absorption results. It is especially applicable for constructing automatically registering HO2 concentration analyzers, due to the simultaneous NO2 absorption and coloring process of the solution.

60272 **APTIC NO. 76309**

Sperduto, B., G. Cecchetti, R. Funiciello, and A. Iannaccone

USE OF THE SCANNING ELECTRON MICROSCOPE WITH AN ENERGY DISPERSION X-RAY ANALYZER, AND OF A QUANTITATIVE IMAGE ANALYZER FOR THE DETERMINATION OF THE NUMERIC PERCENTAGE OF FREE SILICA. *(Impiego del microscopio elettronico a scansione con analizatore quantitativo di immagini per la determinazione della percentuale numerica di silice libera). Text in Italian. Ann. Ist. Super. Sanita (Rome), 9(1):399-408, 1973.*

Using a scanning electron microscope with an energy dispersive X-ray analyzer, it is possible to measure particles with a diameter as small as 0.05 micron, and, for either individual particles or agglomerates, to analyze qualitatively and semiquantitatively all chemicals except those with an atomic number below 9. The electron microscope is compared to the phase contrast microscope on the basis of an analyses of air samples taken from two work areas: a tunnel excavation site and a cement grinding zone. Correspondence of analytical results was poor in the case of the tunnel samples, but it was good for the other set of samples. The electron microscope is better at detecting silicotic hazards. Analysis can be automated by supplementing the microscope with a computer.

60273 **APTIC NO. 67159**

Spurny, Kvetoslaw R.

KINETICS OF THE CLOGGING OF NUCLEPORE FILTERS. *(Zur Kinetik der Verstopfung bei Kernporenfiltern). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 81-85. 12 refs. (Oct. 17-18.)*

Semiempirical description is given of the clogging of analytical nuclepore filters on the basis of experiments with latex aerosol and calculations concerning the evolution of the pressure loss and of the retention efficiency as a function of time. Both the pore radii and the number of the open pores were found to decrease during the clogging process which resulted in an increase in the pressure and in the retention efficiency of the filter. The values of the pressure loss and the retention efficiency as calculated from semiempirical formulae are in relatively good agreement with the experimental curves. It is possible to estimate the useful life of analytical nuclepore filters for the determination of particle size and particle size distribution, and to determine a critical particle count per pore.

60274 **APTIC NO. 67151**

Stahlhofen, W., L. Armbruster, and J. Gebhart

PARTICLE SIZING BY SINGLE PARTICLE OBSERVATION IN A SEDIMENTATION CELL. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 45-49. 36 refs. (Oct. 17-18.)

The development and application of a sedimentation cell for particle size analysis are described. The settling time between two marks was measured to determine the terminal velocity of a particle. For monodisperse polystyrene spheres the agreement between the diameter measured by electron microscopy and the diameter calculated from the mean settling time was within 2%. The influence of Brownian motion on sedimentation was studied on a test aerosol of di-2-ethyl-hexyl-sebacate droplets having a relative standard deviation between 3 and 5%. For particles larger than 1.5 micron the Brownian motion becomes negligible and the sedimentation method can also be used for the determination of the standard deviation. The laser aerosol spectrometer measures the correct value of the original aerosol. Much larger standard deviations were found in the sedimentation cell as a result of diffusive broadening of the settling time in the cell.

60275 **APTIC NO. 81856**

Tanner, L. H.

A PARTICLE TIMING LASER VELOCITY METER. *Opt. Laser Technol., vol. 5:108-110, June 1973. 4 refs.*

A fluid velocity meter that measures the time taken for individual dust particles carried in a flow to travel between two points in space is described. A laser is used to produce two light beams parallel to one another and approximately normal to the flow direction. These beams are focused on two point or line foci which are separated by a distance of about 1 mm in the flow direction. A particle crossing both foci in succession gives two scattered light pulses, and the time interval between these is measured by an oscilloscope or digital chronometer. The method is complementary to the more commonly used Doppler and fringe techniques, though it appears to provide a cheaper and simpler alternative which is more likely to work with natural dust particles for measurements of velocity in steady or slightly turbulent flows.

60276 **APTIC NO. 81520**

Volberg, N. S. and Y. D. Yegorova

DETERMINATION OF NITROGEN DIOXIDE IN THE AIR. ESTABLISHMENT OF THE NITROGEN DIOXIDE-NITRITE ION CONVERSION FACTOR. *Atmos. Diffuz. Zagryazeniye Vozdukha, no. 293:93-98, 1973. 5 refs. Translated from Russian, 11p. (Presented at the Proceedings of the A. I. Voyeykov Order of the Red Banner of Labor Main Geophysical Observatory.)*

Experiments to establish the nitrogen dioxide-nitrite ion conversion factor were conducted to determine the amount of error associated with methods of NO2 analysis which rely on the conversion of NO2 to nitrite ion which is then subsequently determined. Such methods assume that the conversion is 100%. The experiments involved the free placement of the drawn end of a metering device into the inlet fitting of an absorption instrument through which air was drawn at a rate of 0.25 l/min. The NO2 concentration after dilution by air was 0.09-17 mg/cu m. Different quantities of nitrite ion were accumulated in solution by changing the sampling time. The factor for the conversion of NO2 to nitrite ion in pure form was computed as 74%.

60277 **APTIC NO. 84421**

Wood, Warren G., James M. Mathiesen, and John S. Mgebroff

X-RAY ENERGY ANALYSIS OF PARTICULATE MATTER ON FILTER PAPER. *Preprint, Finnigan Corp., Sunnyvale, Calif. and Texas State Dept. of Health, Austin, p. 134-145, 1973 (?). 5 refs.*

The use of X-ray energy in the analysis of particulate matter on filter paper is discussed. The rapid quantitative and qualitative analysis of particulates on air filter samples is increasingly important as more air pollution sampling stations are set up throughout the country. X-ray energy spectroscopy when combined with automated sample handling and the latest data reduction systems provides a technique which enables the analyst to process large numbers of samples and obtain precise quantitative and qualitative data rapidly. The preparation and analysis of typical air filter type samples, and the steps taken to identify the elements in the samples and obtain computerized reduction of the data in microgram/sq cm, ppm, or percent are described. (Author abstract modified)

60278 **APTIC NO. 80227**

Yamane, Tsuneko

DETECTION OF HALOGENS AND SULFUR BY MEANS OF LASER MICROSPECTRAL ANALYSIS. *(Rezo hakko-bunko bunseki ni yoru harogen genso oyobi iou no kenshutsu). Text in Japanese. Bunko Kenkyu (Res. Spectroscop.), 22(5):321, 1973.*

The emission spectroscopy of fluorine, chlorine, bromine, iodine, and sulfur was studied using a Nd-doped glass laser and a ruby laser as the excitation source. The emission lines were photographically measured using high purity potassium fluoride, barium fluoride, lithium fluoride, potassium chloride, sodium chloride, potassium iodide, sodium iodide, thallium iodide, or sulfur powder; the spectral region measured was 2300 to 5000 A. No emission could be detected when the laser was used as the only excitation method, however, with the addition of spark excitation using carbon electrodes, several emission lines of each element could be observed. The emission intensities increased under the discharge condition, producing a spherical spark plasma. The number of observed emission lines was small for fluorine and chlorine; however, many emission lines were detected for bromine, iodine, and sulfur. The emission intensity of fluorine and chlorine tended to be weaker than that of bromine, iodine, and sulfur. The width of the observed spectral lines for these elements was broader than for iron and silicon. The 0.6% thallium iodide in graphite powder could be detected.

60279 **APTIC NO. 61948**

(Inventor not given.)

APPATATUS FOR ANALYZING AMBIENT AIR. *(Beckman Instruments, Inc., Fullerton, Calif.) Brit. Pat. 1,326,520. 9p., Aug. 15, 1973. (Appl. March 1, 1972, 16 claims).*

An apparatus and method for measuring total hydrocarbons as well as the specific quantities of methane, ethylene, acetylene, carbon monoxide, and carbon dioxide in ambient air are described. The apparatus consists of a hydrogen flame ionization detector which operates without the conventional inert gas carriers. An ambient air stream is passed through an oxidizer catalyst in order to remove hydrocarbons into the carrier gas stream flowing to the detector. The ionization current produced by the sample is measured as it flows through the hydrogen flame ionization detector against the steady state background signal produced by the hydrocarbon free air carrier gas also flowing through the detector.

60280 **APTIC NO. 76215**

British Coke Research Assoc., Chesterfield (England)

THE DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN AIRBORNE PARTICULATE MATTER. *Rept. 76, 12p., March 1973. 38 refs.*

The existing methods for the determination of polynuclear aromatic hydrocarbons in airborne particulate matter are reviewed. A reference procedure was developed for the measurement of benzo(a)pyrene, consisting of drawing air through a glass fiber sheet, extracting with cyclohexane, separating by thin layer chromatography, and determining the benzo(a)pyrene concentration by ultraviolet spectrophotometry. The procedure was both sensitive and specific and was successfully applied to the determination of concentrations of benzo(a)pyrene in airborne particulate matter in and around coking plants. (Author abstract modified)

60281 **APTIC NO. 79258**

PHOTOELECTRIC SMOKE AND DUST DENSITY METERS. *APPLICATION AND INSTRUCTIONS FOR USE (CONCLUSION). (Foto-elektronische rook- en stofdichteidsmeters. Toepassingen en gebruiksaspecten (slot)). Text in Dutch. Automatie, 17(6):165-167, June 1973.*

Applications and problems that may occur during the operation of photoelectric smoke and dust density meters are discussed. The soiling of the exposed transparent surfaces can be prevented by scavenging with air, or by the use of a rotary glass plate that is continuously cleaned by a brush. The electric eye should be protected from extraneous light, or modulated light and frequency-specific electric eyes should be used to prevent false readings. The effect of displacements of the emitter and electric eye relative to each other can be counteracted by increasing the size of the light spot.

1972

60282 **APTIC NO. 38672**

Araki, Shun

PRESENT STATION AND PROBLEMS OF AIR POLLUTANTS ANALYSIS. *(Taiki osen busshitsu no bunseki no genjo to mondaiten). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 7(1):3-11, Jan. 1972. 3 refs.*

The analysis of gaseous air pollutants such as hydrogen sulfide sulfur dioxide, sulfur trioxide, nitrogen oxides, carbon monoxide, oxidants, and other gaseous organic compounds (hydrocarbons, aldehydes, organic acids, and organic bases). The proper analysis method should be selected according to the characteristics of a particular air pollutant such as type, concentration, and time change, as well as topographical and meteorological elements. The purpose of the analysis also dictates the method and type of analyzers to be used. A continuous analyzer or an intermittent analyzer can be used. The conductometric continuous analyzer is typical of the former, and the non-dispersion infrared analyzer typical of the latter. General guidelines for sampling were also given. Although JIS lists standard analysis methods applicable to pollution sources, they are not often practical when the concentration of the air pollutant is very low. In this connection, the development of more sensitive analyzers is needed to solve the problem of the low-concentration analysis. The representative analysis methods were introduced including conductometric analysis for SO2; automatic absorption photometric analysis for NOx; use of a non-dispersion infrared analyzer for CO; and gas chromatography for hydrocarbons and other organics. For analysis of oxidants, coulometry and absorption photometry have been used. The new method making use of chemiluminescence in a reaction of Rhodamine B or ethylene has been recently developed for the analysis of oxidant. Difficulties encountered in analysis of offensive odors were also mentioned.

60283 **APTIC NO. 80242**

Bachanova, R. A. and L. V. Ivanchenko

ON THE POSSIBILITY OF USING A PHOTOELECTRIC COUNTER IN A REGION WHERE THE SIZE OF A DROP IS A MULTIVALENT FUNCTION OF THE IMPULSE AMPLITUDE. *(O vozmozhnosti ispol zovaniya fotoelektricheskogo schetchika v oblasti neodnoznachnoy zavisimosti razmera kapli ot amplitudy impul sa). Text in Russian. Nauchno Issled. Gidrometeorol. Inst. (Trudy), no. 114:69-73, 1972. 3 refs.*

It is known that the square of the radius of a drop is a multivalent function of the impulse when the size of a drop is between 0.5 and 2.5 micron. The authors give a method of determining the size by impulse in this interval. The method consists of dividing the entire interval into subintervals where this function is univalent, then replacing it by a linear approximation on each subinterval, and defining the contribution of the function on subintervals in tot. l value of impuse. Thus, the problem is reduced to solving a system of linear equations, and the solutions of this system give the true distribution of the drops by their sizes in spite of the fact that the initial function is multivalent. The method was experimentally verified for drops of silicone oil. The errors of the linear approximation are not higher than 13% and might be reduced by using more exact methods of approximation.

60284 **APTIC NO. 49601**

Berger, A. W., J. N. Driscoll, and P. Morgenstern

REVIEW AND STATISTICAL ANALYSIS OF STACK SAMPLING PROCEDURES FOR THE SULFUR AND NITROGEN OXIDES IN FOSSIL FUEL COMBUSTION. *Am. Ind. Hyg. Assoc. J., 33(6):397-405, June 1972. 41 refs.*

A brief review is given of the state of the art in manual chemical methods for stack sampling and analysis for the oxides of sulfur and nitrogen. The precision and accuracy of analytical procedures and of sampling and collection methods are compared. These results are based on a statistical analysis of the sparse published field data as well as on a significant number of heretofore unpublished power plant measurements. The observed precision (coefficient of variation) in field measurement of sulfur trioxide by absorption in 80% isopropanol is + or - 10 to 20% at 15 ppm. The controlled condensation method (cooling of the flue gas to 60-90 C to form sulfuric acid which is then collected on a filter or glass frit) provides considerable improvement; precision of + or - 4% has been obtained for field sampling at 12 ppm SO3. The collection of sulfur oxides in alkali for SO3 determination leads to high SO3 values and poor accuracy. Collection of sulfur dioxide in dilute aqueous hydrogen peroxide, followed by analysis specific for sulfate, provides the best precision; better than + or - 3% can be attained at SO2 concentrations of about 1000 ppm. Absorption of SO2 in sodium hydroxide or potassium iodide solutions constitute further sampling methods. Regression analysis of field data for determination of nitrogen oxides by the phenol disulfonic acid method suggests that precisions of + or - 3% and 19% are achieved at 1000 ppm and 100 ppm, respectively, for coal-fired power plants.

60285 **APTIC NO. 46565**

Chatot, G., R. Dangy-Caye, and R. Fontanges

DETERMINATION OF THE CORRECTION FACTOR IN THE ESTIMATION OF POLYNUCLEAR AROMATIC HYDROCARBONS SEPARATED BY THIN-LAYER CHROMATOGRAPHY. *(Determination du facteur de correction a apporter au dosage des arenes polynucleaires prealablement separes par chromatographie sur couches minces). Text in French. Chromatographia, 8(5):460-463, 1972. 8 refs.*

The recovery rates of 11 polycyclic aromatic hydrocarbons found commonly in atmospheric dust were determined. Thin-layer chromatography by means of two systems (preparative stage using silica gel as an adsorbent and benzene or cyclohexane as a solvent, and bidimensional chromatography using aluminum and cellulose acetate as absorbents and pentane - ethyl ether and ethanol- toluene-water systems as solvents) was necessary for their separation. The best solvent for the extraction was cyclohexane which is also suitable for the ultraviolet spectrophotometric determination of the compounds investigated. The recovery rates and the corresponding correction factors as obtained for cyclohexane were 65% or 1.54 for fluoranthene, 67% or 1.49 for pyrene, 71% or 1.41 for chrysene, 77% or 1.30 for benzo(a)anthracene, 70% or 1.43 for benzo(a)pyrene, 73% or 1.37 for benzo(e)pyrene, 79% or 1.26 for perylene, 75% or 1.34 for benzo(b)fluoranthene, 97% or

1.03 for ortho-phenylene pyrene, 88% or 1.14 for benzo(ghi)perylene, and 85% or 1.18 for coronene.

60286 **APTIC NO. 47482**

Clements, Robert W. and Michael A. Richard

DEVELOPMENTS IN DYNAMOMETER CONTROL METHODS. *Preprint, Society of Automotive Engineers, Inc., New York, 5p., 1972. 2 refs. (Presented at the Society of Automotive Engineers, National Automobile Engineering Meeting, Detroit, Mich., May 22-26, 1972, Paper 720453.)*

The application of automation to dynamometer testing of engines is examined, with specific reference to three specific test procedures. Specialized circuits and techniques were developed to compensate for limitations inherent within the electromechanical systems used to implement the automation theory. Stable, quick response to a programmed speed change was achieved for engine automatic transmission testing by the use of a parallel feedback technique. Vehicle simulation using analog computer circuitry and road test data was used to calculate torque requirements from programmed acceleration-time and velocity-time curves. Similar circuitry was used to calculate engine-transmission output torque from dynamometer parameters. (Author abstract modified)

60287 **APTIC NO. 81793**

Derr, Vernon E.

THE SPECTRA OF MOLECULES OF THE EARTH S TROPOSPHERE. *In: Remote Sensing of the Troposphere. National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., Chapt. 9, p. 1-32, Aug. 15, 1972. 76 refs.*

GPO

The spectral characteristics of the principal gaseous constituents of the troposphere are discussed in terms of classical and quantum concepts. Topics covered include: the emission and absorption of radiation by molecules, the spectra of diatomic and polyatomic molecules, vibrational and rotational spectra, linewidth as a function of temperature and pressure, and methods of calculating atmospheric attenuation. Absorption spectra are presented for nitrogen, oxygen, water vapor, carbon dioxide, methane, hydrogen, nitrous oxide, carbon monoxide, ozone, and hydrogen chloride.

60288 **APTIC NO. 41315**

Devitofrancesco, G. and C. Conte

COMPARISON BETWEEN PHOTOMETRIC AND GRAVIMETRIC URBAN ATMOSPHERIC PARTICULATE DETERMINATION. *(Comparazione tra misure fotometriche e gravimetriche per la determinazione del materiale particellare in atmosfere urbane). Text in Italian. Inquinamento, 14(1):22- 24, Jan.-Feb. 1972. 6 refs.*

Photometric and gravimetric determination of particulates in the urban atmosphere do not yield identical results because of the manner of interaction between light and particle changes with particle size. The smallest particles (molecules, nuclei) cause Rayleigh dispersion which is proportional to the sixth power of the wavelength of light. Larger particles, whose size is comparable to or larger than the wavelength of incident light, cause Mie dispersion where for isotropic spherical particles, dispersion is proportional to the surface of the particle. In case of larger particles, the laws of classical optics apply, i.e., diffusion is proportional to particle surface but diffraction must be taken into account. The various photometric methods (Organization for Economic Cooperation and Development method and American Society for Testing and Materials method) differ not only by their optical system but also by the way in which they evaluate opacity caused by smoke on a filter. The methods are valid only relatively, not absolutely, only for particulates of constant composition for a certain time and place requiring a calibration curve. If results obtained by these methods are to be expressed in absolute gravimetric units, then simultaneously with the photometric determination, a curve must be constructed indicating the opacity index as a function of mass which again is specific for a certain place and time.

60289 **APTIC NO. 41393**

Fisher, G. E. and D. E. Becknell

SALTZMAN METHOD FOR DETERMINATION OF LOW CONCENTRATIONS OF OXIDES OF NITROGEN IN AUTOMOTIVE EXHAUST. *Anal. Chem., 44(4):863-866, April 1972. 11 refs.*

The Saltzman method was modified to analyze low concentrations (0-200 ppm) of nitrogen oxides in synthetic blends and exhaust gases. The method provides good precision and accuracy over the specified range when compared to the chemiluminescence method. Initially it was successful for the analysis of nitrogen dioxide but not for nitric oxide. Consequently, the method was further modified to utilize ozone to oxidize NO to NO2, the latter of which was reacted with Saltzman reagent in the usual manner. Calibration procedures are discussed. One difficulty encountered in the use of the Saltzman method was the interference due to ammonia. The interference was eliminated when boric acid was added to the reagent. The Saltzman method involves less sophisticated analytical techniques than other wet chemical procedures and is better adapted for use at test sites. Siz samples can be analyzed in about 30 min, once the calibration curve has been established.

60290 **APTIC NO. 47524**

Fultyn, Robert V.

AIR SAMPLING SYSTEM COMPARISON TESTS. *In: Environmental Monitoring in the Vicinity of the Los Alamos Scientific Laboratory. July through December 1971. Los Alamos Scientific Lab., N. Mex., p. 42-44, 1972.*

Comparisons were made to evaluate the relative performance of three types of air sampling systems. The first system combined A Delbag Microsorban 99/98 filter media with a Welsh Manufacturing Company No. 7500-8 charcoal respirator cartridge. The second system was identical to the first except that Whatman No. 41 filter paper was used instead of Delbag Microsorban. The third system consisted of a 2-inch Gelman Metracel GA-3 membrane filter in a typical aluminum 2-inch open-face filter holder, followed by an MSA No. 44135 charcoal cartridge housed in an MSA in-line cartridge holder. The concentration of airborne radioactivity was determined by each system. Examination of a table which summarizes the data collected during this experiment reveals that the performance of the Welsh systems, relative to each other, was much more consistent than performance of the membrane system relative to the Welsh systems. This variability tends to confirm the conjecture that membrane systems tended to leak in field situations.

60291 **APTIC NO. 47309**

Genty, A.

CONTINUOUS SPECIFIC AIR POLLUTION MONITORING POSSIBILITIES BY MEANS OF AUTOMATIZED CHEMICAL METHODS. *(Les possibilites de controles continus specifiques de la pollution atmospherique par voie chimique automatique). Text in French. Colloq. Int. Homme, Air Eau, Paris, France, 1972, 5p. (June.)*

Technicon Autoanalyzers, developed for the continuous, specific monitoring of sulfur dioxide and nitrogen oxides concentrations in the air by means of automatized West-Gaeke and Griess- Saltzman methods are described. The samplers of such instruments apply simultaneous suction of the gas sample and of the specific absorbing solution into an extraction column. Such analyzers can be connected with computers for automatic evaluation. The Air Monitor IV model is suitable for continuous field, or laboratory operation. Another Air Monitor SO2 - NOx model has the options of simultaneous or sequential analysis of SO2 and nitrogen oxides. Another Air Monitor has been designed especially for outdoor use in monitoring networks.

60292 **APTIC NO. 82794**

Gravatt, C. C., Jr.

REAL TIME MEASUREMENT OF THE SIZE DISTRIBUTION OF PARTICULATE MATTER IN AIR BY A LIGHT SCATTERING METHOD. *Preprint, National Bureau of Standards, Washington, D. C., Inst. for Materials Research, 20p., 1972. 8 refs.*

A light scattering method for the real time measurement of the size distribution of airborne particulate matter is described which produces results that are independent of the index of refraction of the particles. The method involves the simultaneous measurement of the intensity of light scattered by a single particle at two small scattering angles as the particle flows through a scattering chamber. The ratio of the two intensities is proportional to the size of the particle but is independent of its index of refraction. The size of each particle can be determined in about 20 microseconds. The lower measurable particle size is about 0.2 micron with a helium-neon laser source and 0.05 micron with an argon laser source. Changes in particle size distribution can be determined within a few seconds by employing a multichannel analyzer as the data storage and readout device. (Author abstract modified)

60293 **APTIC NO. 73494**

Grennfelt, Peringe

COMPARATIVE MEASUREMENTS OF PARTICLE-BORNE SULPHUR BY X-RAY FLUORESCENCE AND OF SOOT BY REFLECTANCE, USING DIFFERENT FILTER MATERIALS. *Swedish Water and Air Pollution Research Lab., Gothenburg (Sweden), Rept. B 133, Nov. 1972. 17 refs.*

X-ray fluorescent measurements of sulfur in airborne-particulate materials were made using two different sampling-calibration procedures. One procedure was based on sampling with membrane filters (Millipore AA) and calibration by dusting, while the other used fiber filters (Whatman 40) and filter impregnation for calibration. The calibration slope obtained by impregnation different by a factor of 1.67 from that obtained with the dusting method. Whatman 40 filters resulted in considerably lower relative intensities during X-ray fluorescence analysis than were obtained with membrane filters. Although filter impregnation was not suitable for absolute calibration, it was satisfactory for relative calibration. Soot measurements with Whatman 40 and Whatman 1 filters revealed greater reflectances for the former and thus greater sensitivities at low concentrations. Whatman 40 filters appeared suitable both for soot and particulate- borne sulfur measurements. (Author conclusions modified)

60294 **APTIC NO. 40727**

Grimmer, G.

DETERMINATION OF TOTAL CONTENT OF POLYCYCLIC AROMATIC HYDROCARBONS IN AIR POLLUTION AND AUTOMOBILE EXHAUST GAS BY CAPILLARY GAS CHROMATOGRAPHY. *(Bestimmung des Gesamtgehaltes aller polycyclischen aromatischen Kohlenwasserstoffe in Luftstaub und Kraftfahrzeugabgas mit der Kapillar-Gas-Chromatographie). Text in German. Anal. Chem. (Berlin), 259(3):213-214, 1972.*

A procedure for the qualitative and quantitative determination of polycyclic aromatic hydrocarbons in automobile exhaust is described. Several filter combinations with the without cooling were tested, and a paraffin-impregnated fine-dust filter with an efficiency of 99.995% for 0.3-0.5 micron, combined with a silica gel layer filter, was best for the test stand sampling for the European cycle. The concentration of the polycyclic aromatic hydrocarbons was made by means of three different ternary solvent systems (methanol-water-cyclohexane, cyclohexane-dimethylformamide-water and cyclohexane-dimethylformamide-water). The samples were divided into four fractions following filtration through silica gel The capillary-gas-chromatographic determination was made on a poly- methylphenylsiloxane- or polydimethylsiloxane-filled steel capillary column of 0.5 mm by 50 m with nitrogen as carrier gas and with flame-ionization detector. The four fractions determined isothermally at 200, 230, 260, and 290 C were naphthalene, dipehnyl acenaphthene, and methyl derivatives (200 C); fluorine, phenanthrene, anthracene, fluoroanthene, pyrene, and methyl derivatives (230 C); benzo(a)-anthracene, chrysene, benzofluoroanthene, benzo(e)pyrene, perylene, dibenz(a,h)anthracene, benzo(a)pyrene, methyl derivatives at chrysene and benz(a)anthracene only (260 C); and benzo(ghi)perylene, anthanthrene, dibenzopyrene, and coronene at 290 C. An intern standard composed of 2.3,6-trimethylnaphthalin, 9-methylanthracene, perylene, and a dibenzopyrene which latter was not present in the dust or the exhaust, was added to each of the fractions, for the quantitative evaluation of the signals delivered by the flame-ionization detector. The dust and exhaust gas samples from the European cycle automobiles revealed considerable differences in the quantitative relations even for the 30 principal components (benzo(a)pyrene 1.00).

60295 **APTIC NO. 42854**

Hale, Wayne E.

SAMPLE SIZE DETERMINATION FOR THE LOG-NORMAL DISTRIBUTION. *Atmos. Environ., 6(6):419-422, June 1972. 2 refs.*

At any sampling location the number of samples depends on the degree of accuracy desired and the variability of the data, such variability usually being described by the geometric standard deviation. Equations are presented for calculating the sample size necessary to determine, within a given probability, the upper and lower confidence limits of the geometric mean of a log normal distribution. Examples of its use are given. (Author abstract modified)

60296 **APTIC NO. 47979**

Herrmann, Guenter

CONTRIBUTIONS TO THE DETERMINATION OF SULFUR DIOXIDE IN THE AIR, AND THE PREPARATION OF SULFUR DIOXIDE-AIR MIXTURES. *(Beitraege zur Bestimmung von Schwefeldioxid in der Atmosphaere und Herstellung von Schwefeldioxide-Luft-Gemischen). Text in German. Abhandl. Saechs. Akad. Wiss. Leipzig, Math. Naturw. Kl., 51(2):1-189, 1972. 317 refs.*

Practical solutions and instruments for the determination of sulfur dioxide in the atmosphere, and results of SO2 monitoring in Dresden are described, with special regard to measurements in smoke-damaged forest areas. Sulfur dioxide measuring instruments, both for short-term and stationary monitoring, have developed on the basis of the pararosaniline method. An air sample of 10 is taken at a rate of 60 l/hr, and the absorbers holding TCM solution can be used as colorimeter tubes as well. Stationary instruments for long-term monitoring have a sampling rate of 8 l/day. The colorimetric evaluation is done by visual comparison with a gelatine filter. The sensitivity of such instruments is 0.2 micrograms. Comparative tests of such instruments with a Havemann colorimeter and Ultragas 3 models showed minor differences in the readings. A method for the extension of the sampling technique by the application of critical flows, such as realized by means of glass nozzles and diaphragms, is described. The preparation of known SO2-air mixtures of 0-5 mg/cu m is possible by desorbing SO2 in counterflow from diluted solutions of sodium metabisulfite at a flow rate of 20-60 l/hr. A strictly linear relationship occurs between the Na2S2O5 concentrations in the solution and the SO2 concentrations. The oxidation of the sulfite ion is inhibited by the addition of ethylenediaminetetraacetic acid adjusted to pH 7.8 by monobasic potassium phosphate. The daily average SO2 concentrations in Dresden and Tharandt, determined in an extensive test series, had nearly logarithmic distribution. The yearly averages for Dresden and Tharandt were 0.17 and 0.21 mg/cu m, respectively. The electrification of the railroad line through Tharandt resulted in a decrease by 80% in the SO2 concentration.

60297 **APTIC NO. 72630**

Jeltes, R.

CONCISE LITERATURE REVIEW ON THE DETERMINATION OF CHLORINE IN THE AIR. *(Beknopt literatuuroverzicht betreffende de bepaling van chloor (in lucht)). Text in Dutch. Instituut voor Gezondheidstechniek TNO, Delft (Netherlands), Rept. H 244, 2p., Oct. 3, 1972. 18 refs.*

Literature on the determination of chlorine in the air is reviewed. Spectrophotometry and gas-chromatography, the methods used most commonly, lack sufficient specificity, like other methods. Mass-spectrometry is the most specific method for chlorine analysis. According to the colorimetric method, chlorine is reacted with o-tolidine or 3,3 prime -dimethylnaphthidine for color reaction. Quantitative, and mainly semiquantitative, determination of chlorine is possible by turbidimetric methods, by absorbing chlorine-containing gas in sodium hydroxide solution and subsequent addition of silver nitrate. Higher chlorine concentrations can be determined by gravimetric or titrimetric methods.

60298 **APTIC NO. 47091**

Kimoto, Toshio

METHODS AND TOOLS FOR MEASUREMENT OF SULFUR DIOXIDE. *(Aryusan gasu no sokutei-ho to kiki). Text in Japanese. PPM (Japan), 3(11):16-26, Nov. 1972.*

Various methods of measuring sulfur dioxide are reviewed by tables and discussions. Explanations with illustrations are given to such methods as the lead peroxide candle, alkaline filter method, and the iron sheet method. The methods of preparing a standard gas, new equipment and permeation tubes are explained. As a standard measurement method in the United States, the pararosaniline method with permeation tube correction is explained. Electroconductivity, colorimetry, flame photometry, and ultraviolet and infrared spectrometry, are briefly reviewed. Important points for precision measurement, such as imperfections of apparatus as standard error, zero drift, span drift, electronic drift, and degrees of sensitivity, response speed, absorption efficiency, and obstacle index, are briefly mentioned.

60299 **APTIC NO. 84480**

Kucharski, Rafal and Hubert Piwowar

THE USE OF A MICROCYCLONE FOR PRELIMINARY SELECTION OF DUST IN MEASUREMENTS OF AIR POLLUTION AT WORK-POSTS. *(Zastosowanie Mikrocyklonu Do Wstepnej Seleckcji Pylow W Pomiarach Zapylenia Powietrza Na Stanowiskach Pracy). Text in Polish. Biul. Sluzby Sanit.-Epidemiol. Wojewodztwa Katowickiego, 16(1):13-21, Jan.-March 1972. 21 refs.*

A microcyclone was used to study dust samples taken from the air at workplaces in different branches of industry with subsequent determination of the size of the dust particles. The polluted air was sucked into the microcyclone at certain speeds through a filter (pore size 0.5 micron), followed by a microscopic determination of the fractional composition of the dust on the filter. In a control study, dust samples were directly removed from the filter in a setup without a microcyclone. The dusts examined were dolomite, carbon, corundum and zinc-lead. It was established that the smallest size of the dust particles on the microcyclone filter was less than 5 micron, thought to be most dangerous to human health. The dust samples taken by microcyclone contained 97-98% of respirable fractions of less than 5 micron in size, whereas control samples varied from 89.2 (dolomite) to 90% (corundum) of the same size. Application of a microcyclone in hygienic-sanitary studies of workplace conditions in industry would be useful, particularly when information about respirable dust fractions was required.

60300 **APTIC NO. 41316**

Liberti, Arnaldo and Domenico Brocco

A PILOT STATION FOR AIR POLLUTION MONITORING. *(Stazione Pilota per il rilevamento dell inquinamento atmosferico). Text in Italian. Chim. Ind. (Milan), 54(3):241-245, March 1972. 14 refs.*

The Pilot Station of the Air Pollution Laboratory of the National Research Council established in cooperation with the Organization for Economic Cooperation and Development designed as a reference center for all activities connected with air pollution monitoring (standardization of analytical methods and of sampling methods, evaluation of measuring instruments, and development of new methods) is described. The Pilot Station monitors pollution by means of discontinuous non-automatic methods measuring sulfur dioxide, nitrogen oxides, oxidants, ammonia, and particulates. It is located in Rome at Tiburtino Citta Universitaria, sampling is performed 25 m above street level in an area of high population density with automotive traffic and domestic heating installation as sources of pollution. Sampling is accomplished by aspiration of 0.5 to 10 l air/min with a membrane pump through a filter which retains particulates into an absorbent solution where the gaseous pollutants are either dissolved quantitatively or where they react chemically. Sulfur dioxide is measured by the hydrogen peroxide method or colorimetrically with pararosaniline. Of the nitrogen oxides, nitrogen dioxide yields nitrite and nitrate ions in solution. The nitrite ion reacts with sulfanilic acid forming a diazonium salt which by coupling with N-(1-naphthyl)-ethylene-diamine yields a pink color, the intensity of which is measured photometrically. Nitric oxide is first oxidized, then measured as NO2. Atmospheric oxidants such as ozone, organics, or hydrogen peroxide liberate iodine from a neutral solution of potassium iodide which is measured photometrically. Ammonia is determined colorimetrically by the Nessler reagent. Particulates are measured by reflectometry, photometry, and gravimetry. Inorganic constituents in particulates are determined spectroscopically. The aromatic polycyclic hydrocarbons are separated by preparative chromatography and determined by gas chromatography. In the winter of 1969, particulates from 1000 cu m air in Rome contained 13.8 micrograms benzofluoranthene and 10.3 micrograms benzopyrene.

60301 **APTIC NO. 38044**

Lucas, D. H., W. L. Snowsill, and P. A. E. Crosse

THE CONTINUOUS MONITORING OF PARTICULATE EMISSION. *Meas. Contr., 5(1):9-12, Jan. 1972. 3 refs. (Presented at the Institute of Measurement and Control, North West Kent Section, Symposium on Measurement and Control of Industrial Pollution, Maidstone, England, April 28-29, 1971.)*

The main effects of particulate emission can be classified as the visual appearance of the emitted plume and the reduction in sunlight, visibility in the general atmosphere, and the effect of the deposition of dust on objects at ground level in the vicinity of the particular furnace. Particulate emissions from the combustion of fuels, therefore, must be monitored by two types of instruments. The fine end of the spectrum can be checked by smoke recorders. The inherent inaccuracies of these instruments can be greatly reduced by the use of a steel tube to maintain alignment, tthe use of Everclean windows, and the automatic use of purging air to record the effective instrument zero. The coarse end off the spectrum can be checked by a flue dust monitor, which is particularly suitable for checking the performance of electrostatic precipitators. (Author abstract modified)

60302 **APTIC NO. 84257**

Matsumura, Y.

CHEMICAL ANALYSIS OF SULFURIC ACID OR SULFURIC ACID ION IN ATMOSPHERE. *(Taikichu no ryusan matawa ryusan ion no kagaku bunseki). Text in Japanese. In: Special Report Concerning Clarification of Photochemical Smog Phenomena. Research Coordination Bureau (Japan), Science and Technology Agency, p. 136-198, 1972.*

Atmospheric sulfuric acid or sulfuric acid ion exists in water drops or contained in aerosols as metallic salts. Sulfuric acid or sulfuric acid ion, as constituents of this kind of aerosol, were sampled and measured. From filters containing sulfuric acid mist and dust, sulfuric acid or sulfuric acid ion was extracted into or dissolved in water, and then estimated to determine which kind of filter would produce nearly 100% dissolution effect and also to determine the difficulty, precision, sensitivity, and interfering factors of various methods of chemical analysis. Membrane filters are chemically stable and show nearly 100% absorption. Some cellulose filters neutralize sulfuric acid somewhat. Glass fiber filters are strongly alkaline and neutralize sulfuric acid. However, when glass fiber filter paper which adsorbed sulfuric acid, sulfuric acid ion was dissolved into water, the yield was the same as with cellulose filters. Therefore, when only sulfuric acid ion is to be measured, glass fiber filters may be used. Of various chemical analysis methods, the alkaline titration method (WHO) and the alkali titration curve method were precise and easy to handle, for acids. For sulfuric acid ion, the Torin method (JIS) and (Tada) were both precise and easy to handle. In order to clarify factors which affect measurement, it is desirable to carry out measurement using more than two methods.

60303 **APTIC NO. 38166**

McNesby, J. R., R. Byerly, Jr., Chris E. Kuyatt, Stanley R. Mielczarek, and Jane E. Doyle

ELECTRON ENERGY LOSS SPECTROSCOPY OF POLLUTANTS. *Natl. Bur. Std. (U. S.) Tech. Note, no. 711:26-28, 73, Jan. 1972. 11 refs.*

GPO: C 13.46:711

A high-resolution electron spectrometer is being developed as a gas analysis tool. The approach is to measure electron energy loss spectra for pure gases at known pressures and under controlled conditions of the electron electron spectrometer. To reduce the effect of instrumental variations, spectra will be calibrated with a reference gas using static or dynamic mixing, or both. Binary mixtures of known composition will then be prepared and their energy loss spectra recorded. The spectra will be analyzed either graphically or via digital computer and sensitivity and accuracy determined. Multicomponent mixtures will then be investigated. Spectra have been obtained for oxygen, nitrogen, carbon dioxide, argon, helium, water, nitrogen dioxide, and sulfur dioxide as well for several molecules of interest: methane, benzene, acetone, n-hexane, ethyl alcohol, trichloroethylene, and nitrous oxide. The spectra are in the form of X-Y recordings and punched paper tape.

60304 **APTIC NO. 47254**

Morita, Hiroyoshi

THE MEASUREMENT METHODS FOR ATMOSPHERIC FORMALDEHYDES AND A CONTINUOUS MEASUREMENT APPARATUS. *(Taikichu horumu arudehido sokuteiho to renzoku sokutei sochi). Text in Japanese. PPM (Japan), 3(11):62-66, Nov. 1972. 3 refs.*

The principles of various methods of measuring formaldehydes in the air are presented. The methods discussed are the West-Gaeke method, the phenyl hydrazine method, the 2-hydrazinobenzothiasol method, the MBTH acid method, and the acetyl acetone method. A new continuous measuring apparatus for formaldehydes in the air is introduced. This apparatus utilizes an improved acetyl acetone method of colorimetry, automatically operated in sequence, and presents hourly averages of formaldehydes in the air. The results are compared with the chromotrope acid method and show a good correlation.

60305 **APTIC NO. 48672**

Okita, Toshiichi and Teruichi Nagami

METHODS OF REMOVAL OF INTERFERENCE OF O3 IN THE MEASUREMENT OF SO2. *(SO2 sokuteiho ni taisuru O3 no bogai no jokyo). Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 125. (Nov. 7-9, Paper 80.)*

Ozone interferes with the measurement of sulfur dioxide when using the West-Gaeke pararosanaline method. Two methods of eliminating the interference were studied. Hydrochinon was packed in a glass tube and was heated to 75 C by a ribbon heater. The O3 concentration of 71.6 ppm at the upper stream of the scrubber was 0.0 ppm at the exit, whereas the SO2 concentration was 105.4 ppm and 100.1 ppm at two locations. The other method used a special grade ferrous sulfate packing in a glass tube. The O3 concentration of 8.4 ppm was 0.0 at the exit, and the SO2 concentration was 1.04 and 1.01 ppm at the entrance and the exit. Then the reaction of SO2 and O3 was examined in a pyrex container of 100.1. The two gases did not react to each other.

60306 **APTIC NO. 83969**

Okita, Toshikazu

MEASUREMENT OF ULTRAVIOLET RADIATION IN THE ATMOSPHERE USING AN ULTRAVIOLET SPECTROMETER. *(Shigaisen bunko kodokei o mochiita taikichu shigaisenryo no sokutei). Text in Japanese. Science and Technology Agency, Japan, Research Coordinating Bureau, In: Special Report Concerning Clarification of Photochemical Smog Phenomena, p. 8-35, 1972.*

A combination of a filter and a photocell now used to measure ultraviolet radiation in the atmosphere has not proved satisfactory, because it cannot measure all the ultraviolet radiation in the sky. A trial model spectrophotometer was tested. The distribution and the angle distribution of ultraviolet radiation were measured from July 19 to 29, 1971 from the roof of the National Public Health Institute, and again on October 15, 19, 22, and 27. It was possible to measure the radiation from the entire sky. Plans to automate the measurement and to check the correlation with oxidant concentrations are in progress, in order to study photochemical phenomena in the atmosphere. The device can also be used to measure the amount of radiation produced by the decomposition of nitrogen dioxide into nitric oxide and oxygen, and as a standard gauge for other instruments that measure ultraviolet light.

60307 **APTIC NO. 48534**

Orvini, Edoardo, T. E. Gills, and P. D. LaFleur

NUCLEAR ACTIVATION ANALYSIS OF SE, AS, ZN, CD, AND HG IN ENVIRONMENTAL MATRICES. *Trans. Am. Nucl. Soc., 15(2):642-643, Winter 1972. 3 refs. (Presented at the American Nuclear Society Meeting, Nov. 12-17, 1972.)*

Neutron activation analysis has a high sensitivity for determination of selenium, arsenic, zinc, cadmium, and mercury. Unfortunately, the most sensitive and useful reactions involve short half-lived isotopes of the elements, thus requiring chemical separation from the activated matrix. A combustion technique that does not involve any wet dissolution of the matrix is described. The method was tested by radiotracer experiments using orchard leaves, bovine liver, coal, and crude oil with excellent agreement with certified values.

60308 **APTIC NO. 81787**

Pijck, J.

BACTERIOLOGICAL ANALYSIS OF AIR. CONSTRUCTION OF A LARGE-VOLUME MANUAL PUMP. *J. Pharm. Belg., 27(3):316-320, 1972.*

A 100-liter manual pump for the high-volume sampling of airborne bacteria is described. The body of the pump consists of a cylindrical, wide-bore glass tube. A leather gasket which is fitted between two plexiglass washers is bolted to and actuated by a stainless steel handle. Two glass tubes provide an inlet for the air drawn through a gas trapping flask and an outlet for the quick exhaust of the pump between strokes. The outlet is provided with a ground joint and a plastic stopper which serves as a valve and automatically closes the orifice when air is drawn through the inlet tube. Sampling results obtained with the manual pump agree with those obtained with conventional high capacity electrical pumps to within + or - 4%.

60309 **APTIC NO. 40479**

Rasmussen, Reinhold A. and Robert S. Hutton

A FREEZEOUT SYSTEM FOR TRACE ORGANIC COLLECTIONS IN REMOTE AREAS. *BioScience, 22(5):294-298, May 1972. 11 refs. (Presented at the American Chemical Society, Division of Water, Air , and Waste Chemistry, 159th, Houston, Tex., Feb. 1970.)*

A battery-powered cryogenic freezeout transfer-storage system, compact enough for back packing into primitive areas, is described. The system functions as a grab sampler and is capable of collecting sufficient race organic gaseous materials for microbiological and chemical studies. It was developed for use in the tropical forest of Panama where the very high relative humidities beneath the forest canopy present a problem to conventional freezeout systems. The grab sampler is constructed of two 1-liter staninless steel beakers clamped together. The bottom beaker is immersed in liquid nitrogen. The top beaker is modified to fit a blower for evacuating the sealed canister, to accept two or more glass pipes to deliver ambient air to the freezing surfaces of the lower beaker, and to accept a stirring jig to knock down the insulating frost that builds up on the cryogenic wall of the lower beaker. The faults of this system are that it requires constant attention during the sampling period, has a variable freezeout efficiency, and cannot be used to accurately calculate the absolute concentration of the components collected in the sampled ambient air. The biological studies showed that specific environmental elements, such as condensable organic volatiles and aerosols, exert a primary influence in establishing the growth of a microbial community on natural and unnuatural surfaces. The results of gas chromatographic analyses of five air samples are also reported.

60310 **APTIC NO. 84370**

Rhodes, J. R., A. H. Pradzynski, and R. D. Sieberg

ENERGY DISPERSIVE X-RAY EMISSION SPECTROMETRY FOR MULTIELEMENT ANALYSIS OF AIR PARTICULATES. *In: Air Quality Instrumentation. Selected Papers from International Symposia presented by the Instrument Society of America. John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 1-16. 16 refs. (Presented at the Symposium of the Analysis Instrumentation Division of the Instrument Society of America, Annual, 18th, May 3-5, 1972.)*

The use of automated radioisotope X-ray fluorescence for the multielement analysis of airborne particulate samples is described. The energy dispersive system uses a silicon (lithium) detector and three radioisotope sources, viz., iron-55, plutonium-238, and cadmium-109. Counting times amount to about 10 min/specimen for the latter two sources and about 5 min for Fe-55. No sample preparation is necessary beyond the cutting of a 2-inch diameter section out of a filter paper sample collector. Measurements are simultaneous for all of the characteristic X-rays excited, and the method is nondestructive. Analytical results for several different sampling locations are presented for calcium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, mercury, lead, arsenic, bromine, strontium, zirconium, and molybdenum. The method s detection limits range from 0.006 micrograms/cu m for elements like molybdenum and zirconium to 0.053 micrograms/cu m for elements like chromium.

60311 **APTIC NO. 80260**

Robertson, D. E., and R. Carpenter

NEUTRON ACTIVATION TECHNIQUES FOR THE MEASUREMENT OF TRACE METALS IN THE MARINE ENVIRONMENT. *Battelle, Memorial Inst., Richland, Wash., Pacific Northwest Lab., and Washington Univ., Seattle, Wash., Atomic Energy Commission Contract AT(45-1)-1830 and AT(45-1)-2225-T24 and National Science Foundation Grant GX-32974, 70p., Sept. 29, 1972. 101 refs.*

NTIS: BNWL-SA-4455

The technology and applications of neutron activation analysis (NAA) for the measurement of trace metal constituents in the marine environmnet is described. The method is used on fresh water, sea water, marine organisms, and sediments, as well as atmospheric particulates. Instrumental NAA (INAA) is more sensitive and selective than analytical methods for the multielement analysis of atmospheric particulates collected on filter media. This method can be used to measure up to 33 elements in urban air. Atmospheric particulate matter is collected on suitable tared filter media by pumping air through the filters. The filters are reweighed after collection and encapsulated in polyethylene irradiation vials. The filters are then neutron activated for predetermined time intervals for the measurement of neutron activation products. The detection sensitivities achieved by INAA for multielement analysis of aerosols are not fixed values, but are dependent to a large degree upon the composition of the sample. Instrumental NAA can directly measure all metal pollutants of interest, except cadmium, lead, and sometimes silver, copper, and mercury. Cadmium, Cu, Ag, and Hg can be measured by neutron activation followed by radiochemical separation of their activation products. Occasionally, Cd, Cu, Ag, and Hg are present on air filters in concentrations too low to measure by INAA and radiochemical separations of the neutron activated filters are necessary to separate interfering radionuclides. The filters and collected aerosols are dissolved by digestion in sulfuric acid-hydrogen fluoride or nitric acid-HF.

60312 **APTIC NO. 42625**

Salyamon, G. S. and L. A. Krashenitsyna

DETERMINATION OF TUNGSTEN AND ITS COMPOUNDS IN THE AIR. *(K opredeleniyu v vozdukhe vol frama i yego proizvodnykh). Text in Russian. Gigiena i Sanit., 37(2):78-79, Feb. 1972. 4 refs.*

Two different photochemical methods of high sensitivity and stability for the determination of different concentrations of tungsten and its compounds in air air are described. The first method, suitable for determining a minimum quantity of 0.5 micrograms in a 5 ml-sample, gives a stable yellowish coloration over four hours. The sample, added to a mixture of one part 25% potassium rhodanide and one part hydrochloric acid and titanium trichloride, is analyzed in a 30 mm-curette or in a spectrophotometer at a wavelength of 400 nm. Reference samples with tungsten contents ranging from 0.5 to 10 micrograms are prepared from sodium tungstate, containing tungsten in a concentration of 10 micrograms ml by means of sodium hydroxide. The second, catalytic method, suitable for tungsten determination in a concentration range of 0.1-0.3 micrograms, is based on the catalytic effect of tungsten on the oxidation of iodine by hydrogen peroxide. The sample is added to a mixture of In-CHl and 0.005M-potassium iodide, after which 0.01-H2O2 is added. The optical density is measured after 5 and 10 min at 20 C. The addition of starch was abandoned to increase the reproducibility. The sampling is independent of the method to be applied. When metallic tungsten is sampled, the sample is incinerated at 600 C. Aerosol filters and absorbers are used for sampling volatile compounds. The samples are treated with NaOH in all sampling techniques.

60313 **APTIC NO. 38280**

Schaefer, K.

UNITS FOR MONITORING WATER AND AIR- THE AUTOMATICC ANALYZER. *(Geraete zur Ueberwachung von Wasser und Luft - die Kontinuierliche Durchflussanalyse). Text in German. Preprint, 6p., 1972. (Presented at the Fachtagung Umwelt (Verschmutzung, Frankfurt/Main, West Germany, March 21-24, 1972.)*

An autoanalyzer is described which can be used in the field of air pollution for determining sulfur dioxide, nitrogen dioxide, nitric oxide, aldehydes, hydrogen sulfide, fluoride, chloride, ammonia, and hydrochloric acid. It can be used in the field of water pollution to determine ammonia, the C.O.D., chromium, copper, cyanide, fluoride, water hardness, nitrite and nitrate, silicates. sulfate and total inorganic phosphate. Autoanalyzers perform all steps of the manual method from sampling to data recording fully automatically, including pipetting, heating-up, and measuring. Manual analysis starts with pipetting, which is performed by the autoanalyzer by the sampler and the pump. If the manual analysis requires filtration, this can be carried out by the autoanalyzer by means of a continuously-operating filter or it can be replaced by dialysis. The entire system of the autoanalyzer is composed of individual components which permit rapid adjustment and provide highest flexibility. Several components in a waste gas flow can be determined simultaneously by dividing the sample flow.

60314 **APTIC NO. 81790**

Schwiesow, R. L.

REMOTE SPECTRAL SENSING OF POLLUTANTS. *In: Remote Sensing of the Troposphere. National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., Chapt. 24, p. 1-22, Aug. 15, 1972. 30 refs.*

GPO

The remote monitoring of ambient air quality by means of long path optical absorption of ultraviolet, visible, or infrared radiation is described along with pollutant distribution mapping by means of scattering spectroscopy. Absorption techniques inherently provide the desired spatial average of pollutant concentration; however, the interference between molecules is unclear. Efficient data analysis techniques are required to analyze the spectra for the many interfering components present. Lidar scattering techniques provide a method for three dimensionally mapping pollutant concentrations. The operational elements of spectrally mapping pollutants involve constituent identification via spectroscopy and spatial resolution via range, elevation, and azimuth information. Individual spectra are presented for nitrogen, oxygen, water vapor, carbon dioxide, ozone, methane, carbon monoxide, hydrogen chloride, hydrogen, and nitrous oxide.

60315 **APTIC NO. 38622**

Sekikawa, Sachio, Hirokazu Naganawa, Hiroshi Murakami, Koichiro Ozawa, and Hitoshi Koike

AIR POLLUTION MONITORING SYSTEM UTILIZING MINI-COMPUTER. *N.E.C. Res. Develop., no. 24:32-47, Jan. 1972.*

An air pollution monitoring system that gathers data from a scanning telemetering system and processes the data using the NEAC-M4 mini-computer is reviewed with respect to system outline, hardware, software, and performance. The system is an on-line real-time data gathering system that measures sulfur oxides, dust density, carbon monoxide, nitrogen oxides, hydrocarbons, oxidants, air temperature, humidity, ultraviolet, rays, visibility, traffic concentration, and wind direction and velocity at the sensor of the monitoring station. The data are converted to digital codes and are transmitted to the central station, where they are processed by the mini-computer; the output is then sent to a display board and typewriter. (Author abstract modified)

60316 **APTIC NO. 45268**

Shendrikar, A. D. and Phillip W. West

MICRODETERMINATION AND LEAD WITH DITHIZONE AND THE RING-OVEN TECHNIQUE. *Anal. Chim. Acta, 61(1):43-48, 1972. 14 refs.*

A method for the microdetermination of lead with dithizone by the ring-oven technique is presented. The limit of detection is 0.04 micrograms, and the range is 0.05 to 1 microgram of lead with no interference from other species that are of significance in air pollution studies. The determinations can be made directly on samples collected on sequential tapes. The applicability and reliability of this method for air pollution studies were verified by analyzing Mexican air samples simultaneously by atomic absorption spectrometry and the ring oven. The total lead content of each sample was calculated and the data compared with that obtained by the ring-oven method. The data show good agreement. The lead content of the Mexican air sample by lead content of Mexican air sample by atomic absorption spectrometry ratios were 17.20/18.90, 8.80/8.90, 5.70/6.00, 5.30/5.60, 4.30/4.70, and 8.20/9.10. This method is especially recommended for field studies because it is sensitive, rapid, reliable, and far less expensive than methods current in use for lead determinations.

60317 **APTIC NO. 47395**

Soole, B. W.

A RE-EVALUATION OF THE EFFICIENCIES OF SOME ROTARY IMPACTION FILTERS FOR THE REMOVAL OF 10-40 MICRON DROPLETS FROM A FAST- FLOWING AIR STREAM. *Aerosol Sci., 3(4):275-279, July 1972. 4 refs.*

Three hundred sets of data obtained by cascade impactors in the course of experiments to determine the filtration efficiencies of two sets of rotary impaction filters were re-evaluated using as stage calibration diameters effective drop sizes iteratively selected according to the apparent mass median diameters and standard geometric deviations of the sampled distributions. Correlations with log-normal distributions were significantly better than with previous calculations and yielded practical values of filter penetration at dp, the smallest droplet diameter of material of unit relative density for which the filters were designed to have a theoretical penetration of zero, approximately 36% less than before. The trends of filtration efficiency with dp and with filament diameter at constant dp remained unchanged. (Author abstract modified)

60318 **APTIC NO. 81791**

Strauch, R. G. and A. Cohen

ATMOSPHERIC REMOTE SENSING WITH LASER RADAR. *In: Remote Sensing of the Troposphere. National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., Chapt. 23, p. 1-35, Aug. 15, 1972. 55 refs.*

GPO

The status of meteorological laser radar (lidar) probing of the lower atmosphere is reviewed. Topics discussed include: Mie scattering in the atmosphere, Rayleigh scattering, Raman scattering, atmospheric absorption, resonant scattering, temperature measurement using Raman Backscatter, atmospheric water vapor measurements by Raman lidar, the spectral analysis of atmospheric nitrogen by Raman lidar, the measurement of tropospheric aerosols by laser radar, turbidity and visibility measurements, and future directions for laser probing of the atmosphere. Water vapor profile measurements by laser radar using Raman backscatter of selective absorption are presently feasible. Temperature profiles appear to be obtainable from Raman profiles of oxygen and nitrogen.

60319 **APTIC NO. 84656**

Suzuki, T., T. Okita, and Y. Watanabe

ANALYSIS OF LOW LEVEL HYDROCARBONS IN ATMOSPHERE BY GAS CHROMATOGRAPHY. (Taikichu teikyu tanka suiso no gasu kuromato gurafu no yoru bunseki). Text in Japanese. In: Special Report Concerning Clarification of Photochemical Smog Phenomena by Research Coordination Bureau of Science and Technology Agency, p. 36-78, 1972.

It is necessary to measure the more than 100 individual hydrocarbons (more than 10 have been measured) in order to completely understand photochemical activity in the atmosphere. Each hydrocarbon has different photochemical activity and stability in the atmosphere. Lower grade hydrocarbons, with fewer carbons, which are supposed to exist in great quantity, were chosen for careful study to serve as basic data for studying the sources of pollution. Various kinds of environments and sources were selected for carrying out experiments: the roof top of the National Public Health Institute, Tokyo Tower, the Kashima Industrial petrochemical complex, various automobile exhausts, roads in Tokyo, an underground parking lot at Yaesu, and the Nihonzaka Tunnel of Tomei Highway. Columns with high separation performance, standard gas at very low concentrations, high sensitivity detectors, and delicate concentration work are necessary since these hydrocarbons are in the order of ppb. Dimethyl sulforan columns, hydrogen flame ionization detectors, and concentration by means of cooling with liquid oxygen were applied, to enable measurement of concentrations less than 1 ppb in 100-200 ml samples. The distribution pattern of hydrocarbons, by components and by concentration, was the same in Tokyo as at the edges of roads, indicating that the influence of automobiles is great in Tokyo. The reason that the distribution pattern in Kashima is different from that of Tokyo may be that there is less influence from automobiles there. At Kashima, however, there was more propylene and acetylene.

60320 **APTIC NO. 78150**

Teramoto, M.

METHOD OF AIR POLLUTION MEASUREMENT AND ITS RELATED PROBLEMS. *(Taiki osen sokutei to sono mondaiten). Text in Japanese. Preprint, Japan Society of Civil Engineering, p. 11-32, 1972. (Presented at the Japan Society of Civil Engineering Lecture Meeting, Tokyo, 1972.)*

The Air Pollution Prevention Law lists solution conductivity method, light scattering method, non-dispersive infrared, Saltzman method and colorimetry by potassium iodide reaction for the analysis of sulfur oxides, airborne particulates, carbon monoxide, nitrogen dioxide and oxidants. In JIS K0104-1968 and Japanese hygienic experimental method, a Saltzman coefficient of 0.5 is used. Results of studies in which various analytical conditions including absorbing tube, absorbent, suction rate, and coloring agent were examined showed the original value of 0.72 to be more accurate. Measurement of SOx by AP meter usually gives lower values compared to the rosaniline method. The interference of NO2 in the rosaniline method can be eliminated by the addition of 0.03% sodium azide or 0.06% sulfamic acid. The AP meter is not influenced by NO and NO2, but is influenced by hydrogen chloride, chlorine, and ammonia. The differences in the measuring values between AP meter and the rosaniline methods, checked by solution conductivity method, are attributed to the loss of solvent by evaporation and adsorption of SO2 by the dust filter in the AP meter.

60321 **APTIC NO. 84224**

Tomura, M., N. Yamate, and T. Matsumura

TRIAL MODEL OF SMALL OXIDANT GAUGE. *(Okishidanto kogata keisoku sochi no shisaku kenkyu). Text in Japanese. In: Special Report on Photochemical Smog Phenomenon. Research Coordination Bureau (Japan), Science and Technology Agency, p. 98-115, 1972.*

Studies were made to develop smaller apparatus for oxidant measurement. In the neutral potassium iodine extinction degree method, iodine is liberated and its absorption of ultraviolet light is translated into ozone. The device consists of analysis and recording sections. The analysis part handles sampling and measurement of extinction, output from which enters the hourly average concentration recording unit. In the recording unit, changes in concentration are recorded. The gradation is 0-0.05 ppm (as ozone). The specifications of the analysis unit are: height 426 mm, width 300 mm, depth 434 mm, weight 25 kg; recording unit: 426 by 320 by 185 mm, 5 kg; the average concentration recording unit: 300 by 440 by 290 mm, 23 kg. The range of error was -0.002, or -0.003, or +0.001 ppm. When there was a 100 + or - 10 V change, there was no change in the figure indicated. The absorption of oxidant by the absorption tube was 97.4% effective. The change in sampling air current was less than 2%. The measurement figures obtained by this new device correspond closely with those obtained by

60322 **APTIC NO. 49341**

Uthe, Edward E. and Charles E. Lapple

STUDY OF LASER BACKSCATTER BY PARTICULATES IN STACK EMISSIONS (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., National Environmental Research Center Contract CPA 70-173, EPA-R2-72-089, Proj. SRI 8730, 158p., Jan. 1972. 20 refs.*

NTIS: PB 212530

The validity of determining smoke plume opacity or particulate content from measurements of the backscatter of laser radiation from plume particulates was investigated. The backscatter experiments were conducted with the use of an aerosol chamber that allowed the experimental geometry to simulate that associated with actual remote plume probing. Raw fly ash collected from a bituminous coal-burning power plant was classified into various size fractions and pneumatically injected into the chamber at controlled concentrations. The aerosol was continuously monitored by a white light transmissometer along the axis of the chamber. Lidar measurements were made to determine the backscatter and transmission of the generated aerosols. At a wavelength of 0.7 micron, the backscatter-to-extinction ratio was independent of particle size, and the backscatter- to-mass concentration ratio was inversely proportional to the volume-to-surface mean diameter. At a wavelength of 1.06 micron, the backscatter-to-extinction ratio was more dependent on particle size and the backscatter-to-mass concentration ratio was less dependent on particle size than at the 0.7 micron wavelength. The results for fly ash indicate that plume opacity may be determined from lidar backscatter measurements at 0.7 micron wavelength, but the mass concentration is better inferred from 1.06 micron lidar backscatter measurements.

60323 **APTIC NO. 81855**

Wende, R. D., R. T. Clancy, and G. B. Jackson

A TENTATIVE DIRECT COLORIMETRIC METHOD FOR AQUEOUS SULFITE SUITABLE FOR ATMOSPHERIC ANALYSIS OF SULFUR DIOXIDE. *Am. Lab., vol. 4:46-52, Jan. 1972. 28 refs.*

A direct colorimetric method for the determination of atmospheric sulfur dioxide is described2 The method is based on the reduction properties of SO2 in a ferric iron solution and the simultaneous complexation of the ferrous iron produced. The complexing agent is ferrozine which forms a magenta iron II complex at pH values between 4 and 9 with an absorption maximum at 562 nm where the molar extinction coefficient is 27,900. A Bausch and Lomb Spectronic 20 colorimeter is used to measure the percent transmittance or absorbance of the solutions. The ratio of ferrozine to ferric ion is 1.5:1 for optimum color development. Possible atmospheric compounds that may produce interference with the method are not yet evaluated in the gaseous state; however, hydrogen sulfide is expected to seriously interfere and must be removed prior to absorption of the gas in the absorbing solution. The method appears to be applicable for determinations of SO2 at concentrations ranging from 13-90 micrograms SO2/25 ml with a relative precision of 1-5%.

60324 **APTIC NO. 84215**

Yamaki, N., M. Suzuki, K. Imagami, and N. Hobara

STUDY ON DEVELOPMENT OF PHOTOCHEMICAL SMOG MEASUREMENT TECHNOLOGY. *(Kokagaku sumoggu sokutei gijutsu no kaihatsu ni kansuru kenkyu). Text in Japanese. In: Special Report on Photochemical Smog Phenomena. Research Coordination Bureau (Japan), Science and Technology Agency, p. 83-97, 1972.*

Studies were made in order to obtain necessary basic data for standardization of oxidant measuring instruments. The figures from the different types of existing instruments do not necessarily correspond to each other. The major measuring instruments presently marketed were tested, measuring oxidant in atmosphere, with the influence of coexisting nitrogen oxides and sulfur dioxide also examined. Responses varied greatly between the colorimetric method and others, but the trend of changes in a day, when hourly figures were compared, corresponded very well. Although there were sometimes exceptions, when oxidant concentration rose during the day, ozone concentration, measured by the chemiluminescent method, gave higher figures, establishing the fact that the major component of oxidant is ozone. Interference by SO2 is avoided by attaching a chromium trioxide scrubber to the sampling device of the oxidant measurement instrument, which oxidizes SO2 to SO3. Then nitrogen dioxide remains as a coexisting influence. Nitrogen oxide itself does not influence measurement, but when oxidized by the chromium trioxide scrubber, it turns into NO2 and thus has an influence. The performance and life of the chromium trioxide scrubber must be examined, as well as the influence of such other coexisting compounds as hydrogen sulfide, aldehyde, dust, and chlorine on measurement.

60325 **APTIC NO. 48561**

Yamamoto, Osamu, Makoto Shimizu, and Hideo Kumazawa

SALTZMAN METHOD FOR DETERMINATION OF OXIDES OF NITROGEN IN AUTOMOTIVE EXHAUST. *(Zarutsuman-ho yoru jidosha haigasu-chu no chisso sankabutsu no sokutei). Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 313. (Nov. 7-9, Paper 260.)*

The oxidation of nitric oxide by ozone enables the measurement of nitrogen oxide concentration in automotive exhaust gas by the Saltzman method. By heating the mixture of nitrogen oxides and ozone, satisfactory results were obtained. The glass tube was heated directly by the platinum wire placed in the glass, or by winding the tube with a wire heater. The latter method (indirect heating) was more satisfactory. The concentration of NO was 107 ppm; NO2, 104 ppm; and ozone, approximately 500 ppm. At approximately 150 C, voltage 20 V, the three curves of NO2, NO2 plus O3, and NO plus O3 agreed, the NO was almost completely changed into NO2; and NO2 measurements were not affected by O3. However, in this process, various chemical reactions may be conjectured; it is inconceivable that NO simply oxidized and turned into NO2. Calibration tests were given by diluting the gas with air. The measurements fluctuated with low concentrations, but measurements of NO and NO2 were possible with between 20 and 100 ppm of the mixed gas. A pilot automatic analyzer is now being constructed using this oxidation method.

60326 **APTIC NO. 42669**

Yoshida, K.

INTERNAL COMBUSTION ENGINE - EMISSION GAS TEST FOR GASOLINE ENGINE. *(Nainen kikan - Gasorin enjin ni okeru haiki gasu testo). Text in Japanese. Kikai Sekkei (Mech. Design), 16(4):11-16, April 1972. 8 refs.*

Procedures are discussed for measurement of engine emissions when a test automobile is operated, mounted on the chassis dynamometer. The test automobile is operated in the drive pattern set after that of urban traffic. The emission gas test is performed in four-mode cycle (Japanese standard) or in seven-mode cycle (U. S. standard). The emission includes exhaust gas from the exhaust pipe, crankcase gas from the crankcase, and evaporation gas from the fuel system. For density measurements of the exhaust gas, the sampling tube is inserted deep into the exhaust pipe. For weight measurements of the exhaust gas, the samplers available include total bag, CVS (constant volume sampler), and proportional sampler. The nondispersive infrared (NDIR) is generally used for the continuous measurement of carbon monoxide, carbon dioxide, hydrocarbons, and nitric oxide and the ultraviolet analyzer for nitrogen dioxide. Of the total HC emitted from the engine, the NDIR is not sensitive enough to methane, olefins, and aromatics, thus failing to measure total HC. To remedy this shortcoming, the NIDR is often supplemented by a flame ionization analyzer to measure the total HC. Measurement of NO by the NIDR is more or less affected by the interfering components present. It is also difficult to manufacture a NDIR that can measure the low range of NO concentration. Because of this, a NO analyzer using chemiluminescence is being developed and used for measurement of NO. Among the measuring methods for the evaporation loss of fuel are the syringe, condensation, activated carbon, specific gravity, and concentration methods.

60327 **APTIC NO. 67123**

IG-TNO Research Inst. for Public Health Engineering, Delft (Netherlands)

REVIEW OF ANALYTICAL METHODS FOR THE DETERMINATION OF ENVIRONMENTAL POLLUTANTS. *18p., Dec. 1972. 150 refs.*

Automated methods for the sampling and analysis of various environmental pollutants found in indoor and outdoor air, water, soil, and biological media such as urine are tabulated by medium, apparatus, limits of detection, reference reports and publications, and special remarks. Pollutants listed include: organic acids, aldehydes, alcohols, particulates, carbon monoxide, carbon dioxide, halogen compounds, metal compounds, hydrocarbons, halogenated hydrocarbons, hydrogen, hydrogen peroxide, ketones, oxides of nitrogen, oil mists, ozone, oxygen, phenols, silicates, solvent vapors, sulfur oxides, sulfuric acid, sulfur, and isocyanates.

1971

60328 **APTIC NO. 43053**

Armstrong, C. W.

EMERGING IMPORTANCE OF PROCESS MEASUREMENTS IN THE MINERALS INDUSTRY. *Preprint, American Mining Congress, Washington, D. C., 21p., 1971. 4 refs. (Presented at the American Mining Congress, Mining Show, Las Vegas, Nev., Oct. 11-14, 1971.)*

With the advent of increasing activity by state, local, and federal agencies concerning environmental matters, the minerals processing industry has sought better methods for obtaining information on process flow, temperature, pH, and concentrations of trace gases. An examination of the transition which has taken place in smelting process measurements over the past two years in response to standards in some parts of the country which obligate the smelter plant to prove 90% recovery of sulfur contained in the concentrate indicates the awareness that a meaningful materials balance for the smelter can only be taken if the mass flow of concentrate feed and gaseous effluent from the smelter is accurately determined. Stack gas flow involves simultaneous measurements of off-gas temperature, gas velocity, particulate loading, and sulfur dioxide concentration. Of these variables, gas temperature, concentration of SO2, and sampling of particulate loading can be measured with reasonable certainty and facility. On the other hand, gas velocity is difficult to measure and causes a substantial inaccuracy in the mass flow calculation. New techniques, however, involving vortex-shedding principles offer the possibility of measuring gas velocities over a broader range than previously possible. The measurement of smelter feed material is also a problem area. At Kennecot, belt scales are used extensively to monitor quantities of green feed, flux, and precipitate copper. Because accuracy is highly dependent upon the slope of conveyor and uniformity of material loading on the belt, such scales rarely can be used for precise inventory tonnage measurement. Just as new sensing devices are eagerly sought for use in the smelter, new instrumentation for the mill is also emerging. Three relatively recent additions to the measurement capability are the particle size monitor, energy dispersion X-ray, and the solids meter. Experience gained in making better and more precise measurements in the smelter indicates that there is a need to monitor tonnage rates, assays, and mill loads with higher certainty. Because of the almost endless variety of instrumentation and monitoring devices, a sensible on-site trial is nearly always necessary along with an economic analysis.

60329 **APTIC NO. 76257**

Cochrane, T. S., G. Knight, L. C. Richards, and W. Stefanich

COMPARISON OF DUST SAMPLING INSTRUMENTS. *Dept. of Energy, Mines and Resources, Ottawa (Canada), Mines Branch, Rept. R 250, 168p., Oct. 1971. 40 refs.*

The range of dust concentrations obtained with a wide range of dust sampling instruments was investigated. The instruments were exposed to a wide range of dust clouds prepared in a laboratory dust chamber. The dust clouds were prepared from five minerals and one synthetic material to cover the range of particle density from 1.4 to 5 g/cu cm and of particle shape from near cubic through plate to fibrous. The clouds were dispersed by five techniques to give a range of size distribution and different states of aggregation. A number of subsidiary investigations are also reported which examined the collection efficiency of certain dust sampling instruments and compared aerodynamic respirable dust size selectors. Changes in design that are apparently minor can have a large effect on the respirable dust concentration indicated by a sampler that has an aerodynamic size selector. Physiological factors must be considered in applying dust sampling instruments to assess health hazards. (Author abstract modified)

60330 **APTIC NO. 42706**

Cook, Charles S. and George W. Bethke

THE REMOTE MEASUREMENT OF SMOKE PLUME TRANSMITTANCE USING LIDAR. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C. Air Pollution Control Office and General Electric Co., King of Prussia, Pa., Space Sciences Lab., 26p., 1971 (?). 8 refs.*

A van-mounted ruby lidar system has been developed for the remote single-ended measurement of smoke plume transmittance at ranges from 150 to 500 m. The measurement of transmittance is obtained by comparing the clear air lidar return from the near side of the plume to the return from the far side. The system has been tested using synthetic targets and its accuracy limitation is photomultiplier afterpulsing. This caused a maximum systematic error of less than 12% for transmittance greater than 0.50 and less than 2.5% for transmittance greater than 0.80. Since any error is always positive, the lidar measurement inherently yields an upper limit value for transmittance. The lidar technique provides an absolute, remote measure of plume transmittance which requires only a clear optical path to the plume independent of ambient lighting conditions. Field operation shows a good agreement with telephotometric techniques.

60331 **APTIC NO. 40864**

Dams, R.

STUDIES ON THE COMPOSITION OF INORGANIC AEROSOLS POLLUTANTS BY MEANS OF NON-DESTRUCTIVE ACTIVATION ANALYSIS. *(Studie van de anorganische samenstelling der pollutie-aerosols met behulp van niet-destruktieve aktiveringsanalyse). Text in Dutch. J. Belge Radiol., 54(6):735-745, 1971. 12 refs. (Presented at the Belgische Vereniging voor Stralingsbescherming, Brussels, Belgium, Feb. 13, 1971.)*

A non-destructive method, developed for the quantitative analysis of natural and pollution aerosols, and its applications are described. While glass-fiber filters, being inorganic, cannot be applied, polystyrene filters (microsorban, Delbag) as well as cellulose filters (Whatman 41) were best for non-destructive analysis. The chemical analysis was made by means of neutron activation and high-resolution gamma-spectrometry, and the data obtained were processed by a compouter. Each sample was irradiated twice; short-lived isotopes were produced by the first irradiation (5 min), followed by two measurements with the gamma-spectrometer (3 and 15 min, respectively). After a total of 13 elements were determined, a second irradiation was made by means of a higher neutron flux over 2-5 hr and 22 more elements were determined by comparison to a standard filter that was irradiated simultaneously. The concentrations of 33 elements can thus be determined under optimum conditions. The technique was applied in a study of the diurnal concentration variations of the aerosols elements as a function of the meteorological conditions, where the disturibution of different elements was determined as a function of the particle size by means of a cascade impactor. The geographic distribution of aerosol elements was investigated in another study. The method has the advantages of requiring short sampling times and of contributing to the study of various atmospheric phenomena.

60332 **APTIC NO. 41869**

DeNee, P. B.

MINE DUST CHARACTERIZATION USING THE SCANNING ELECTRON MICROSCOPE AND DUST SAMPLERS. *Scanning Electron Micros., vol. 4:209-216, 1971 8 refs.*

Inhalation of respirable coal mine dust in the size range of 0.1-10 micron diameter, and retention in the lungs, is a serious hazard in coal mining. Various modes of the scanning electron microscope such as secondary electron emission, backscatter electron emission, cathodoluminescence, and X-ray were applied to the characterization of respirable coal dust. Important properties are size, shape, volume, mass, surface topography, agglomeration charactristics, chemical makeup, and mineral content. Experimental techniques for preparing the substrate for mounting the dust specimens are described. Elemental identification, which is important since it allows inferences to be made about the mineral species to which particles belong, was done by energy dispersive X-ray analysis. The importance of collecting meaningful dust samples which can be analyzed in the scanning electron microscope is discussed and illustrated through the use of four collecting devices: thermal precipitator, filter, cascade impactor, and midget impinger. (Author abstract modified)

60333 **APTIC NO. 38089**

Dobrochiver, I. G., S. P. Akchurina, N. Y. Zuzykina, G. P. Zorina, and L. N. Shishkin

CHROMATOGRAPHIC DETERMINATION OF WASTE GASES FROM PYRO- METALLURGICAL PROCESSES. *(Khromatograficheskiy analiz otkhodyashchihk gazov pirometallurgicheskikh protessessov). Text in Russian. Zavodsk. Lab. (Moscow), 37(2):158-159, Feb. 1971.*

Waste gases from pyrometallurgical processes were separated in two successive gas chromatographic colums: a 1 m silica gel C-3 column for sulfur-containing gases and carbon dioxide and a 6 m molecular sieve NaX column. Both columns were operated at 60 deg with helium as carrier gas at 100 ml/min. Analysis took 8 min. The minimum amounts detectable in a 1 ml sample were 0.1% (v/v) for oxygen, carbon monoxide, carbon dioxide, hydrogen sulfide, and carbonyl sulfide and 0.5% (v/v) for carbon disulfide and sulfur dioxide.

60334 **APTIC NO. 38509**

Elfers, Lawrence A.

FIELD OPERATIONS GUIDE FOR AUTOMATIC AIR MONITORING EQUIPMENT. *PEDCo-Environmental Specialists, Inc., Cincinnati, Ohio, Office of Air Porgrams Contract CPA 70-124, Rept. APTD-0736, 163p., July 1971. 35 refs.*

NTIS: PB 202249

The selection, installation, and operation of automatic air monitoring equipment are examined. Measurement methods for suspended particulates, carbon monoxide, hydrocarbons, nitrogen dioxide, photochemical oxidants, ozone, and sulfur dioxide are reviewed with respect to selecting the number and location of sampling stations; shelter design; instrumentation specifications; calibration; installation of equipment; routine operation; maintenance; data logging; installation and operating costs; and personnel requirements. Operating characteristics are examined for conductivity, colorimetry, coulometry, flame photometry, flame ionization detectors, nondispersive infrared photometry, nephelometry, reflectance and transmittance measurements, and chemiluminescence detection techniques.

60335 **APTIC NO. 41385**

Fernandez, C.

SILICA DETERMINATION. COMPARING METHODS: X-RAY AND INFRARED SPECTROGRAPHY. *(Dosificacion de silice. Comparacion de metodos: rayos X y espectrografia de infrarrojo). Text in Spanish. Med. Segur. Trab., 19(75):39-44, 1971. 7 refs.*

Samples of atmospheric dust from mines were heated at 450 C for 18 hrs, and the free silica was determined in the presence of silicates by the infrared band at 700 and 780 to 800/cm. Aluminum oxides interfered, but mica, calcite, kaolin, ferric oxide, and others did not. Grain size below 7 micron has no effect. Reported results (2.5 to 17.0% silica) agreed well with the X-ray diffraction results.

60336 **APTIC NO. 42692**

Fontijn, Arthur and Richard J. Ronco

UTILIZATION OF THE NO/O3 CHEMILUMINESCENT GAS REACTION IN AIR POLLUTION MONITORING. *Preprint, American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Inst. of Electrical and Electronics Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; and National Oceanographic and Atmospheric Administration, Washington, D. C., 5p., 1971. 9 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1066.)*

The homogenous chemiluminescent reaction: nitric oxide plus ozone yielding nitrogen dioxide and oxygen, is used to monitor NO and O3 levels, free of interference by other pollutants and air constituents, in a multifunctional detector. The principle of the method is briefly discussed and field instrument, including automatic internal calibration systems is described. The limit of sensitivity is about 2 ppb and the response is linear with respect to concentration of the pollutant being measured. By using a converter upstream from the monitor, some other gases, including NO2, are converted to NO and monitored as such. (Author abstract modified)

60337 **APTIC NO. 67071**

Harman, J. N., III

CONTINUOUS COULOMETRIC ANALYSIS OF AMBIENT OXIDES OF NITROGEN (NO AND NO2). *Preprint, Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 4-7, 1971, Paper 71-554.)*

The bulk of all data collected on ambient air nitrogen dioxide and nitric oxide levels has been based on the manual or continuous, automated colorimetric determination of NO2 by the Griess-Saltzman reaction. Some of the problems with this technique associated with maintenance, complexity, and cost, made it desirable to develop a less expensive, more reliable, easily maintained, and accurate method based on the Hersch cell. The Hersch cell operates on the principle of secondary coulometric titration in either the galvanic (oxidant species) or electrochemically driven (reductant species) mode. It is a very sensitive technique using the electron as a titrant. The NO2 analyzer using a Hersch cell operating in the galvanic mode for the detection of NO2 at levels up to 1 ppm is discussed. Ozone is used for conversion of NO to NO2.

60338 **APTIC NO. 40675**

Inaba, Fumio

MEASUREMENT OF AIR POLLUTION BY LASER. *(Reza ni yoru taiki osen no sokutei). Text in Japanese. Oyo Butsuri (Tokyo), 40(11):1261-1267, Nov. 1971. 32 refs.*

The applicability of laser-radar for air pollution monitoring and photochemical smog measurement was studied by reviewing basic formulas, published material, the present state of application, and the future trend. Graphic studies of relationships between wavelengths of electromagnetic waves and diameters of various pollutant particles in the air were examined, and it was confirmed that a laser-radar had a unique ability to detect aerosols and suspended particulates. Various basic methods for air pollution information data measurement using the laser were classified and compared. Basic classifications are dispersion, natural emission, and absorption. Data on wavelengths, resonance, mutual influence quenching effect in the air by collision with molecules and atoms in the atmosphere, and problems in actual use are presented. The measuring technique of suspended particulates by Mie dispersion can be applied to obtain various information concerning temperature inversion layer distribution patterns, quantitative measurements of visibility, analyses of smog and fog density distributions, stack gas distributions, and effective stack height measurements. Raman dispersion laser-radar is capable of selective detection and remote analysis of certain pollutants. Possibilities for measuring specific pollutants utilizing laser resonance are discussed.

60339 **APTIC NO. 76430**

Jepsen, Anders F. and Lee Langan

GAS FLOW MEASUREMENT BY PLUME ANALYSIS WITH A BARRINGER CORRELATION SPECTROMETER. *Flow, vol. 1:361-367, 1971 (?). Presented at the American Society of Mechanical Engineers Fluids Engineering Conference, Pittsburgh, Pa., 1971.)*

The use of a Barringer correlation spectrometer to remotely measure the number of molecules of a target gas along its line of sight is described. The technique involves measuring the exact geometry and molecular content of the plume downwind of a stack in order to define the pattern of dispersal as well as accurately monitor the rate of emission of the gas. The energy source for the spectrometer is Raleigh scattered light from the sky, and the medium is the atmosphere. The instrument calculates the cross correlation function between the total light spectrum in a specific wave band and a mask function unique to the target gas by mechanically vibrating the spectrum and performing the integrations with a photomultiplier tube. Maps of gas flow over a region can be made provided that there are only small temporal or spatial vibrations in the wind during the time of traverse. Such maps can be used to characterize the pattern of gas dispersal and to define the optimum array of fixed sensors for air quality monitoring. Field trials of the technique are reported for sulfur dioxide and nitrogen dioxide plumes.

60340 **APTIC NO. 43078**

Keller, Charles W.

APPLICATION OF ULTRAVIOLET SPECTROPHOTOMETRY IN POLLUTION ANALYSIS. *Preprint, Beckman Instruments, Inc., Fullerton, Calif. Applications Research, Inc. 11p., 1971. 39 refs. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectrometry 22nd, Cleveland, Ohio, March 1971.)*

Ultraviolet-visible spectrophotometry continues to play a major role in determining pollutants in atmospheric, water, and solid samples. Methods and results for typical components are reviewed in terms of sensitivity, reliability, and convenience. Comparisons are made with alternate techniques. Recent developments in instrumentation are described which greatly improve the capabilities of ultraviolet systems. Automatic sampling is among these developments. (Author abstract modified)

60341 **APTIC NO. 67057**

Morgan, George B. and Guntis Ozolins

AIR QUALITY SURVEILLANCE. *In: Introduction to the Scientific Study of Atmospheric Pollution. B. M. McCormac (ed.), Dordrecht, Holland, D. Reidel Publishing, 1971, p. 152-153.*

The measurement of the atmospheric concentration of air pollution is discussed. States are required by the Clean Air Act Amendments to monitor for total suspended particulates, carbon monoxide, ozone, sulfur dioxide, total hydrocarbons, and photochemical oxidants. Information on pollution levels is obtained through the operation of networks of monitoring stations. The development of source and emission inventories, through stack measurements, questionnaires, and engineering calculations, provides information on the types and amount of pollutants emitted into the air and identifies the sources of pollution. An air quality monitoring system is composed of sampling measurement networks, laboratory support, and data handling and analysis. Trends in urban air quality are discussed including particulates, sulfur dioxide, metals, and gases.

60342 **APTIC NO. 42790**

Morrow, Norman L., Rene R. Bertrand, and Homer J. Hall

INSTRUMENTATION AVAILABLE FOR THE MEASUREMENT OF PARTICULATES, SULFUR DIOXIDE AND NITROGEN OXIDES IN THE AMBIENT ATMOSPHERE. *Combustion, 43(3):32-35, Oct. 1971. 15 refs. (Presented at the Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, March 22, 1971.)*

The current and future status of instrumentation to measure particulates, sulfur dioxide, and nitrogen oxides is reviewed. The determination of dustfall consists of the placement of a plastic bucket, whose base area is well defined, and with relatively high sides, into a holder which maintains it upright. The dust which settles in the bucket in some time period is determined by weighing and expressed as g/sq m/mon or tons/sq mi/mon. Two techniques in wide use for the measuremnt of suspended particulates are tape samplers and hi-volume samplers. Sulfur dioxide is measured by conductimetric, coulometric, colorimetric, electrochemical, and spectriscopic methods. Nitrogen oxides levels are determined by colorimetric and electrochemical methods. It is anticipated that current trends towards non-wet chemical instrumentation will accelerate, particularly for those pollutants which are present in the atmosphere in the highest concentrations. Current measurement philosophies indicate that the indicator concept will be brought further into play. That is, only a few pollutants, such as SO2 and particulates, will be measured continuously, and these will serve as indicators of the overfall pollution level. Since only a few indicator pollutants will be measured continuously, most instruments will be built with an eye towards cumulative measurements.

60343 **APTIC NO. 75098**

Mueller, James C., Huel C. Tucker, Anatol Wojtowicz, and George W. Wooten

AN INSTRUMENT FOR MEASURING TRACE QUANTITIES OF OXIDES OF NITROGEN IN AIR (FINAL REPORT). *Monsanto Research Corp., Dayton, Ohio, Dayton Lab., Environmental Protection Agency Contract CPA 70-70, Rept. MRC-DA-309, 49p., 1971.*

An instrument that is capable of continuously monitoring nitrogen oxides down to less than 20 ppb is described which is based on the chemiluminescent reaction of nitric oxide and nitrogen dioxide with atomic oxygen. The instrument is designed for field operation and possesses a read-out system that is compatible with most commonly used data acquisition systems. Atomic oxygen is generated by a high voltage discharge in an atmosphere of 85% argon and 15% oxygen at 1 torr pressure. The atomic oxygen enters a reaction chamber where it reacts with NO and/or NO2 which enters via a sample inlet. A photomultiplier monitors the light emitted by the atomic oxygen stream before it mixes with the sample stream, and a second photomultiplier monitors the chemiluminescent reaction in the chamber. (Author summary modified)

60344 **APTIC NO. 38154**

Murata, Takeshi, Seiji Takahashi, Taketsugu Saito, and Tatsuo Kato

ANALYSIS OF TRACE AIR POLLUTANTS WITH GC-MS. *(GC-Ms ni yoru taikichu kyokuchi biryoseibun no bunseki). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 28(2):85-87, July 1971. 6 refs.*

Air samples condensed by an air concentration device were analyzed by a gas chromatograph (GC) and GC-mass spectrometer (MS) combined system. And low-grade hydrocarbons, chlorate compounds, and nitrogen compounds were identified. About 100-180 l of air was condensed by a low-temperature absorption air concentration device to change the analysis object of ppb order into ppm order. Gas chromatograms of the condensed air sample were obtained under such operating conditions the condensed air sample was sent into a TCP 25% Shimalite column of 40-120 C, using nitrogen gas as a carrier and a flame ionization detector as a detector. Gas chromatograms of condensed air samples which were collected at Suginami-ku, Tokyo every hour the day before the first outbreak of photochemical smog in Japan were shown. Such components of gasoline were seen at the peaks with benzene and toluene as main components, and pentane, hexane, and octane. The pattern changes considerably with a short period of time, and these peaks became small. The mass spectrum of the same air samples was obtained by LKB-9000 GC-MS. We estimated organic compounds which were considered to have been formed.

60345 **APTIC NO. 67072**

Poli, A. A.

AIR MONITORING FOR CARBON MONOXIDE AND METHANE WITH A SINGLE ANALYZER. *Preprint, Instrument Society of America, Pittsburgh, Pa., 5p., 1971. (Presented at the Instrument Society of America, Annual Conference, 26th, Chicago, Ill., Oct. 4-7, 1971, Paper 71-553.)*

A method is described for the rapid slug monitoring of air samples to give a continuous and unattended record of carbon monoxide and methane content on one analyzer, in the low ppm range. The physical and electronic makeup of the system based on gas chromatography are discussed. Alternate configurations are discussed, showing components in the air sample that can be measured along with CO and CH4. Long-term data is presented to show instrument reliability and precision. The process gas chromatography instrumentation does not have sensitivity and cross-sensitivity as a problem. Calibration is easier and less expensive in a multiple component chromatograph than in separate flow through monitors. Expandability or the ability to change the analysis both in quality and sequence can be considered an advantage. The system can be reliably used in air pollution monitoring. (Author abstract modified)

60346 **APTIC NO. 38358**

Reichner, Philip

GAS ANALYSIS METHOD. *(Westinghouse Electric Corp., Pittsburgh, Pa.) U. S. Pat. 3,620,931. 6p., Nov. 16, 1971. 5 refs. (Appl. Nov. 12, 1968, 7 claims).*

The design criteria and operating procedure of a gas analysis method for thee continuous and quantitative determination of the proportion of one gas e.g., carbon dioxide, in a mixture of gases are presented. Previous techniques have been based on the properties of the gas to be measured; as such, costs greatly increased when more than one gas was to be measured. Prior devices have also been limited to samples of relatively constant compositions. The present method provides for continuous measurement of the concentration of a constituent gas in a mixture of gases and for continuous sampling of the initial gas mixture. The gas mixture is divided into two streams for selectively removing the constituent gas in one of the streams to form a second mixture. The partial pressure of the second component of the mixture and of the second mixture are then determined and compared. The difference in partial pressures is related to the quantity of thee constituent gas in the initial mixture. (Author summary modified)

60347 **APTIC NO. 43058**

Reynolds, W. D. and J. G. Green

A HIGHLY ACCURATE CALIBRATION INSTRUMENT FOR SENSITIVE SPECIFIC AIR POLLUTION MONITORS. *Preprint, Electro. Mass Lab., Danville, Calif., 26p., 1971. 1 ref.*

A digital permeation tube instrument for the preparation of dynamic gas standards has been developed. This instrument is easily converted to almost any type of gas usage, is highly accurate and traceable to NBS standards, and is highly stable over long periods of time. Helium, nitrogen, of some other matrix gas passes through a high precision digital flow controller and then to the reference side of a dual thermistor thermal conductivity cell. It then passes over the permeation tube or disc membrane and into the sample side of the cell. A low-level binary gas stream can now be used for any purpose, such as to calibrate an analytical instrument. Each component of the instrument is described in detail. Two different types of permeation systems were used in evaluating the instrument for both low pressure liquefied gases, such as sulfur dioxide, and other gases including methane, carbon monoxide, or nitrogen dioxide. The results of tests to determine the accuracy of the instrument are given. The standard deviation was 0.3% or less for SO2 and NO2 over a 24-hour period.

60348 **APTIC NO. 42999**

Ronco, Richard J. and Arthur Fontijin

OPERATIONS HANDBOOK FOR THE AEROCHEM PROTOTYPE CONTINUOUS CHEMILUMINESCENCE NO MONITOR (FINAL REPORT). *AeroChem Research Labs., Inc., Princeton, N. J., Air Pollution Control Office Contract CPA 70-79, APTD 1115, AeroChem TP-258, 40p., 1971. 4 refs.*

NTIS: PB 209837

A prototype ambient air nitric oxide monitor based on the NO/ozone chemiluminescence reaction was designed. The air being monitored and the second reactant, partially ozonated oxygen, enter the reaction vessel through separate inlets. Rapid mixing occurs and a chemiluminescent reaction takes place. The intensity of the light emitted is measured by the photomultiplier tube and associated read-out devices. Design considerations and operation of the instrument are outlined, as well as installation, maintenance, troubleshooting, and other operating instructions.

60349 **APTIC NO. 37206**

Sofuku, M., S. Izumikawa, H. Yamazaki, and T. Odaira

DETERMINATION OF PAN IN ATMOSPHERE. *(Taikichu no PAN no bunseki ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air pollution), 6(1):44, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

In order to confirm the actual existence of photochemical reactions in Tokyo air, peroxyacetyl nitrate which is known to be a substance produced by photochemical reaction, was investigated by gas chromatography; a syringe was used for sampling. The existence of PAN was qualitatively confirmed. Generally, it is detected when nitrogen dioxide concentration is low and the intensity of the sunlight is considerably high. However, final assessment has to be delayed until more data has accumulated.

60350 **APTIC NO. 43061**

Stevens, Robert K., J. A. Hodgeson, Lewis F. Ballard, and Clifford E. Decker

RATIO OF SULFUR DIOXIDE TO TOTAL GASEOUS SULFUR COMPOUNDS AND OZONE TO TOTAL OXIDANTS IN THE LOS ANGELES ATMOSPHERE - AN INSTRUMENT EVALUATION STUDY. *Preprint, American Chemical Society, Washington, D. C., 33p., 1971. 9 refs. (Presented at the American Chemical Society, National Meeting, 161st, Los Angeles, Calif., March 1, 1971.)*

During the past 3 years, several promising air pollution monitoring systems were developed by the Air Pollution Control Office and tested on a limited scale. A comprehensive evaluation program was designed to compare these newly developed instruments with classic procedures for measuring ambient concentrations of sulfur dioxide and ozone. The following SO2 monitoring principles were compared: colorimetric (West-Gaeke), conductometric, coulometric, flame photometric, and combined gas chromatographic- flame photometric. A colorimetric analyzer and a coulometric system were used as oxidant monitors, while a modified Regener and Nederbragt system were used to measure ozone. The evaluation was performed in Los Angeles over an 83-day period between September and December 1970. The flame photometric detector and gas chromatographic-flame photometric detector instruments required the least maintenance and were operational for more than 93% of the evaluation period. Coulometric and conductometric SO2 measurements were consistently higher than values obtained by flame photometric measurements. Hydrogen sulfide and methyl mercaptan were occasionally present in the Los Angeles atmosphere. SO2 frequently exceeded 0.030 ppm during the afternoon, and total gaseous sulfur in Los Angeles was better than 90% SO2. Ozone and oxidant measurements corrected for nitrogen dioxide are equivalent at peak concentrations during the daylight hours in downtown Los Angeles. (Author summary modified)

60351 **APTIC NO. 80226**

Suzuki, Takeo, Toshikazu Okita, Shigeharu Mutsu, Sadao Omichi, Toshio Hasegawa, Hiroshi Watanabe, and Hiroshi Kosako

COMPARISON OF AIRBORNE PARTICULATES CONCENTRATION MEASUREMENTS BY LIGHT-SCATTERING, TAPE AIR SAMPLER, AND FILTER WEIGHING METHODS. *(Hikari sanran ryushi nodo-ho, tepu ea-sanpura-ho, roshi juryo nodo-ho ni yoru taikichu ryushijo bushitsu nodo no hikaku sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), no. 6:90, 1971.*

The correlation between the values for airborne particulate concentration as measured by light-scattering, tape air sampler, and filter weighing methods is discussed. The weighing method was by a low volume air sampler in which airborne particulates were collected on a glass fiber filter. The three methods were used at the same location in 4 cities to measure the airborne particulate concentration and obtain 24-hour average values. The correlation between the particulate levels measured by the light scattering method and by the weighing method ranged from 0.76 to 0.93. The correlation between the tape transmittance and weight concentration method ranged from 0.70 to 0.74, while that between the tape reflectivity and weight concentration methods ranged from 0.26 to 0.64. Therefore, the correlation of the weight concentration of airborne particulates was best with the light scattering method.

60352 **APTIC NO. 67115**

Tsuji, Kusuo

STUDIES ON THE SUSPENDED PARTICLES IN AIR. I. DETERMINATION OF COPPER, LEAD, CADMIUM AND ZINC IN AIR BY LOW TEMPERATURE RADIO FREQUENCY OXIDATION APPARATUS AND POLAROGRAPHY. *(Taikichu no fuyu funjin ni kansuru kenkyu (daiipo) teion kaika sochi to poraroguraftu-ho ni yoru fuyu funjinchu no do, namari, kadomiumu, aen no teiryo). Text in Japanese. Eisei Shikensho Hokoku (Bull. Natl. Inst. Hyg. Sci. (Tokyo)), vol. 89:21-24, 1971. 6 refs.*

The use of low temperature radio frequency oxidation followed by polarography is described for the direct determination of lead, copper, cadmium, and zinc in suspended particulates. A glass or polystyrene fiber filter with adsorbed fine particles on its surface is inserted into the low temperature radio frequency oxidation apparatus, and the particles are ashed under the following conditions: oxygen flow rate of 70 ml/min, 150 watt output power, and 3 hrs of heating at 100 C. The ash obtained is extracted twice with 10 ml of hydrochloric acid, and the acid extract is diluted to the concentration required for the test. The most suitable pH value is around 7.2. Half wave potentials for Cu, Pb, Cd, and Zn are minus 0.16, minus 0.47, minus 0.67, and minus 1.19 volts (versus a standard calomel electrode), respectively, in the measuring range of 0-minus 1.40 volts.

60353 **APTIC NO. 42503**

Villalobos, R., D. Stevens, R. LeBlanc, and L. Braun

DESIGN AND PERFORMANCE OF A GAS CHROMATOGRAPH FOR AUTOMATIC MONITORING OF POLLUTANTS IN AMBIENT AIR. *Preprint, American Chemical Society, Washington, D. C.; American Institute of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Institute of Electrical and Electronic Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; National Oceanographic and Atmospheric Administration, Washington, D. C., 22p., 1971. 8 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1065.)*

A gas chromatographic method is described for the measurement of total hydrocarbons, methane, carbon monoxide, ethylene, and acetylene with a sensitivity of as much as 1 ppm full scale. This method is incorporated into a commercially availble instrument designed specifically for continuous and unattended ambient air monitoring applications in accordance with analysis requirements set forth by the Environmental Protection Agency. Overall design and construction of the system is outlined and a description given of the various sections in the system. Operating experience with a number of early units led to a number of design changes to overcome difficulties encountered in the original design. The purity requirements for the carrier gases were more completely established in the light of operating experience to date. Linearity and dynamic range were measured experimentally and the results of these test are described. The system is linear to within the range of experimental error for total hydrocarbons and methane to at least 400 ppm and for CO to 1000 ppm and may be linear to the design limits of the electronics. Precision is within 1/2% for extended periods of automatic operation at concentrations at the 1 ppm level. Overall design and performance meet the requirements specified for continuous ambient air monitoring instrumentation. (Author abstract)

60354 **APTIC NO. 42506**

Walsh, John V.

DEVELOPMENT OF AN ATMOSPHERIC CONTAMINANT ANALYZER FOR SPECIALIZED APPLICATIONS. *Preprint, American Chemical Society, Washington, D. C.; American Institute of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Institute of Electrical and Electronic Engineers, New York; National Aeronautics and Space Administration, Washington, D. C.; National Oceanographic and Atmospheric Administration, Washington, D. C., 6p., 1971. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1122.)*

Miniaturized mass spectrometers have been developed for the continuous monitoring and control of trace constituents in specialized applications. Special consideration has been given to long term stability, reliability and simplicity of operation, which have allowed unattended operation for periods of up to 90 days. Specific applications to atmospheres, underwater habitat, and submarine environments are described. (Author abstract)

1970

60355 **APTIC NO. 23883**

Babcock, Lyndon, R., Jr.

A COMBINED POLLUTION INDEX FOR MEASUREMENT OF TOTAL AIR POLLUTION. *J. Air Pollution Control Assoc., 20(10):653-659, Oct. 1970. 19 refs.*

A method for estimating total air pollution is described and is applied to three examples. The method is called pindex and is based on proposed air quality standards and other generally accepted tenets of air pollution technology. Pindex sums air pollution contributions from particulate matter, sulfur oxides, nitrogen oxides, carbon monoxide, hydrocarbons, oxidant, solar radiation, and particulate-sulfur oxides synergism. Within the pindex method, oxidant is synthesized from nitrogen oxide and hydrocarbon precursors, the degree of conversion being controlled by a solar radiation term. Next, tolerance factors based on air quality standards are used to reduce all the pollutant levels to an equivalent basis. Tolerance factors vary from 214 for oxidant to 40,000 for carbon monoxide. The synergism term is set equal to the concentration of the limiting reactant (sulfur oxides or particulate matter). Finally the six equivalent concentrations plus the synergism term are summed to yield the pindex level. The pindex method is easily revised so that tolerance factors may be updated, or additional pollutants may be added in the future. Using a gross weight basis, transportation is responsible for 60% of total USA emissions. Most of this pollution is carbon monoxide. However, when these data were subjected to pindex evaluation, the transportation category dropped to 19% of the total behind the industrial and electric power generation categories. Because of their lower tolerance levels, particulates, sulfur oxides, and nitrogen oxides all surpassed carbon monoxide in pollution severity. The pindex method was applied to air quality data for ten individual cities. Chicago and Los Angeles ranked highest, while San Diego ranked lowest. The results of the pindex evaluation were roughly comparable with those published in an earlier U. S. Public Health Service study which used a different ranking method. Jet engine emission data were also subjected to pindex evaluation. Use of clean burner cans eliminated 99% of the hydrocarbon emissions, but the pindex evaluation showed that much of the hydrocarbon reduction was neutralized by increased nitrogen oxide emissions.

60356 **APTIC NO. 42489**

Christie, A. A., R. G. Lidzey, and D. W. F. Radford

FIELD METHODS FOR THE DETERMINATION OF NITROGEN DIOXIDE IN AIR. *Analyst, 95(1130):519-524, May 1970. 14 refs.*

Two field methods are proposed for determining 2-10 ppm nitrogen dioxide in air. One is a liquid absorption method based on the Saltzman modification of the Griess-Ilosvay reaction in which NO2 recovery is improved by the incorporation of sodium arsenite in an alkaline absorption solution. The second, a test paper method unaffected by humidity and air, involves the use of papers treated with p-anisidine and glycerol, with a storage life of 3 mo. In both methods the apparatus required is easy to manipulate and transport and less than 10 minutes are required for a complete determination. (Author abstract modified)

60357 **APTIC NO. 23132**

Kothny, E. L.

A MICROMETHOD FOR MERCURY. *Am. Ind. Hyg. Assoc. J., 31(4):466-471, July-Aug. 1970. 25 refs.*

A spectrophotometric method for determining small amounts of mercury is based on the reaction of mercuric ion with iodide and crystal violet. Interferences are eliminated by adding sulfite in excess of oxidants, ethyleneglycol monomethyl ether, and ethylenediaminetetraacetic acid. A single extraction step with toluene suffices to determine 0.1 micrograms of mercury in a 1-cm cell with a standard spectrophotometer at 605 nm. Beer s law is followed up to absorbance one. A molar absorptivity of 5600 was obtained with a solvent-to-aqueous phase ratio of 1/20. Procedures are described for air, vegetation, and urine analysis. (Author abstract)

60358 **APTIC NO. 43074**

Patterson, Ronald K.

TECHNIQUE FOR DETERMINING TOTAL CARBON, HYDROGEN, AND NITROGEN IN ATMOSPHERIC AEROSOLS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Chemistry and Physics, 20p., 1970. 6 refs.*

A technique is presented for analyzing total carbon, hydrogen, and nitrogen in atmospheric aerosols with a Perkin-Elmer Model 240 Elemental Analyzer (with gas pruification accessory). This instrument uses a modified Pregl-Dumas combustion train and is characterized by a static, self-integrating system from which steady state measurements of combustion products can be made. The detection system consists of three pairs of thermal conductivity cells in series, one pair each for carbon dioxide, water, and nitrogen. The platinum filaments of each cell pair are connected differentially in a bridge circuit. The analytical procedure is described, as well as calibration of the instrument.

60359 **APTIC NO. 67116**

Sawicki, Eugene

ANALYSIS FOR AEROTOXICANTS. *CRC Critical Rev. Anal. Chem., 1(3):275-333, Nov. 1970. 565 refs.*

Analytical methods are reviewed for a variety of aerotoxicants. Toxic compounds considered include: carcinogenic polynuclear hydrocarbons (arenes, aza arenes, and imino arenes); cocarcinogens such as certain alkanes and phenols; polynuclear anticarcinogens; respiratory irritants such as benzene, acetyl peroxide, formic acid, 2-methylbutene-2, 2-methylpentane, peracetic acid, and propylene oxide; allergens of the protein and glycoprotein type, including pollens; coallergens and antiallergens; mutagenic and/or carcinogenic alkylating agents; lachrymators such as formaldehyde, acrolein, and peroxyacyl nitrates; and phytotoxicants such as ethylene, sulfur dioxide, ozone, oxidants, and fluorides. Analytical methods cited include: electrochemical techniques, chromatography, colorimetry, spectrophotometry, fluorescence techniques, various spectrometric methods including mass spectrometry, and histamine bioassay tecniques (for allergens).

1969

60360 **APTIC NO. 81779**

Ahlquist, N. C. and R. J. Charlson

MEASUREMENT OF THE WAVELENGTH DEPENDENCE OF ATMOSPHERIC EXTINCTION DUE TO SCATTER. *Atmos. Environ., vol. 3:551-564, 1969. 15 refs.*

The use of an integrating nephelometer to measure the wavelength dependence of atmospheric extinction due to scatter is discussed in relation to air pollution monitoring. Atmospheric haze usually acts as a minus-blue filter for either solar radiation or for the viewing of objects at a distance. Dark objects are obscured by a blue haze. The presence of heavy pollution at low humidity often results in a brown appearance, sometimes attributed to nitrogen dioxide. Light scattering measurements associated with the occurrence of carbon monoxide, sulfur dioxide, and aerosols are presented for the Seattle, Washington area. Either the size distribution of automotive aerosols quickly becomes the same as other atmospheric aerosols or the Seattle aerosol is dominated by an automotive source according to the data obtained during several weeks of continuous measurements.

60361 **APTIC NO. 23764**

Hunter, Donald C.

CONTINUOUS AIR QUALITY MONITORING IN NEW YORK STATE. *Preprint, 7p., 1969. 1 ref. (Presented at the Technicon International Congress, Chicago, Ill., June 4-6, 1969.)*

Governor Rockefeller approved legislation in 1966 making it possible to expand air quality monitoring in New York State. Continuous monitoring, with telemetry linking the remote stations to a time-sharing computer and a data reception center in Albany, was chosen as the most practical means of implementation. A 50- station network of primary continuous monitors, augmented by some 300 satellite stations (either small continuous monitors or intermittent manual sampling stations), was planned. The objectives of the network would be: (1) to determine general levels of air pollution and improvements with respect to time, (2) to serve as part of a statewide Alert and Warning System, and (3) to provide data for correlation with effects on the various receptors. After thorough study, continuous wet chemistry instrumentation, using nationally established, well recognized standard procedures with high accuracy and relative freedom from interferences, was specified for determination of sulfur dioxide, nitrogen oxides, aldehydes, and oxidants. Infrared absorption was specified for carbon monoxide, hydrogen flame ionization for total hydrocarbons, and reflectance measurement for soiling. The stations were also designed for continuous measurement of various meteorological parameters. Nine of the first eleven primary stations are on site. The job has not been without problems. Current philosophy of regional control of air pollution emphasizes the need for instrumentation of high accuracy, specificity, and durability. Design of each instrument as a completely integrated system appears to be the direction toward which all instrument manufacturers should strive. (Author abstract modified)

60362 **APTIC NO. 42597**

Kaneko, M., A. Naito, S. Fushida, J. Matsuzaki, S. Fukui, and S. Sugano

ATMOSPHERIC MERCURY MEASUREMENT METOD BY ATOMIC ABSORPTION PHOTOMETER. *(Genshi kyuko kodoho ni your kukichu no suigin no teiryoho).*

Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 4(1):105, 1969. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 10th, Tokyo, Japan, 1969, Paper 105.)

Some improvements were made on a previously published method of measuring the mercury content in the air, and results were highly reliable and satisfactory. Test air is collected in potassium permanganese solution and sulfuric acid hydroxyl amine solution is added. Primary tin chloride solution is added, and mercury salt is reduced to metal. In the test device, the air is circulated between the cell and the test jar. When the gasified mercury passes the cell, the absorption photometry of mercury steam at 253.7 millimicron is measured. Methods for reagent preparation, measurement, and mathematical formula for mercury concentration determination are explained.

60363 **APTIC NO. 43980**

Katz, M.

DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS AND OTHER CARCINOGENS. *In: Measurement of Air Pollutants. Guide to the Selection of Methods. Geneva, World Health Organization, 1969, Chapt. 5, p. 49-53, 116-123. 282 refs.*

Concentrations of polycyclic hydrocarbons (PAH) are so small even in heavily populated cities, that they are reported in micrograms/1000 cu m of air sample. The usual procedure for collection of the sample is filtration of air with a high-volume sampler at a rate of 1-1.5 cu m/min, collecting particulate matter on a high-efficiency glass-fiber sheet. This method does not volatilize or otherwise change the PAH samples; for accurate results, the samples should be collected at high flow rates over a short period (24-48 hr) and analyzed immediately. The hydrocarbons in filtered particulate matter can be readily extracted with benzene or cyclohexane. The extract is usually reduced to 50 ml by distillation, and is then evaporated to 2 ml at room temperature with an electric blower. The extracts of hydrocarbons remain stable for several months if protected from ultraviolet light. The first step in the analysis of a complex mixture of PAH in a solution or extract is adsorption on a chromatographic column of solid adsorbent. Standardized alumina is a convenient adsorbent since it adsorbs compounds with a greater number of condensed rings more strongly than those with fewer rings. A number of absorption spectrophotometric methods are used to determine the amounts of hydrocarbons present in chromatographic fractions. The most reliable ultraviolet absorption method is the baseline technique; narrow baselines of 5-8 mm in wavelength should be used to reduce the effect of interference by the spectra of other related hydrocarbons. In absorption spectrophotometry, the peak absorption wavelength of a compound is not affected by the presence of other compounds; quenching effects are absent; and the absorption spectra of many pure PAH are available in literature. Many available polycyclic hydrocarbons are insufficiently pure for use as reference standards, and are, therefore, difficult to analyze. Since these PAH occur in the atmosphere in very low concentrations, extremely sensitive analytical methods are necessary.

60364 **APTIC NO. 43985**

Katz, M.

NONAUTOMATIC METHODS FOR THE DETERMINATION OF AIR POLLUTANTS. *In: Measurement of Air Pollutants. Guide to the Selection of Methods. Geneva, World Health Organization, 1969, Annex 4, p. 67- 99, 116-123. 282 refs.*

The basic principles and procedures, sensitivity, apparatus, and reagents for various nonautomatic methods for the determination of particulate and gaseous pollutants in air are reviewed. Substances reported to cause interference are also included. Methods for analysis include spectrophotometry, the MBTH method, the distillation method, colorimetry, the fluorimetric method, spectrographic methods, the indicator tube method, iodine pentoxide method, infrared spectrometry, a microdiffusion method, nephelometric methods, the Saltzman method, turbidimetry, the West and Gaeke method, the conductimetric method, polarography, and the lead peroxide method. The pollutants which may be determined by the specified methods include acrolein, aliphatic aldehydes, ammonia, arsenic, beryllium, cadmium, carbon disulfide, carbon monoxide, chlorine, chromium trioxide and salts of chromic acid, inorganic fluorides, formaldehyde, hydrochloric acid, chlorides, hydrogen cyanide, hydrogen sulfide, lead, manganese, methanol, nitrates, nitric oxide, nitrogen dioxide, oxidants, phenols, particulate sulfates, sulfur dioxide, and sulfuric acid mist.

60365 **APTIC NO. 35723**

Matthews, K. J., M. K. Parr, and G. R. Stern

A WATER-COOLED SMOKE METER FOR THE ESTIMATION OF SOOT CONCENTRATIONS IN NATURAL GAS FLAMES. *J. Inst. Fuel, 42(342), 275-278, July 1969. 4 refs.*

A water-cooled smokemeter probe for determining carbon concentrations in natural gas flames consists of a water jacket and a sampling tube, which fits inside the water jacket and carries the filter paper. The axial position of the sampling tube in the water jacket can be varied to control the temperature of the gases at the filter paper. As determined by calibration tests, the probe is accurate to within plus or minus 25% for Shell smoke numbers between 3.0 and 9.0 and covers soot concentrations from two to 400 micrograms. By reducing sampling flow rate to 250 cc/min, this range can be extended to four microgram/liter. At a flow rate of 2.5 l/min, a sampling time of five seconds is possible, provided the sampling tube is inserted well into the carrier tube. The probe water jacket can also be used to obtain samples of combustion gases for analysis.

60366 **APTIC NO. 42482**

Mortstedt, S. -E. and K. -E. Egeback

SIMPLIFIED INFRARED INSTRUMENTS FOR EXHAUST CARBON MONOXIDE MEASUREMENTS DURING IDLING. *(Forenklade infrarodinstrument for CO-matning vid tomgang). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. TPM-BIL-38, 1p., July 11, 1969.*

Specifications of four different simplified infrared instruments, designed for carbon monoxide measurements during idling, are presented. The Hartmann-Braun type CO-tester has a condensate trap involving possible errors, as does the Bosch EFAW 215 type. Both instruments have electronic calibration. The measuring ranges of the CO-tester and the Bosch EFAW 215 instruments are 0.10% as well as 0-5% and 0-10%, respectively. The KFZ-Kompakt-UNOR instruments has a measuring range of 0-10%, calibration gas in separate tube, automatic flow control with indication, and condensate trap with automatic stop when error occurs. The MEXA-200 type instrument has two measuring ranges of 0-5% and 0-10%, calibration gas in separate tube, flow indication, and separate condensate pump. It is designed for routine control purposes.

60367 **APTIC NO. 42483**

Mortstedt, S. -E.

MEASURING EXHAUST CARBON MONOXIDE CONTENTS UNDER IDLING CONDITIONS AT CAR REPAIR SHOPS AND INSPECTION STATIONS. *(Matning vid verkstader och kontrollstationer av bilavgasers koloxidhalt vid tomgang). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-39, 10p., Aug. 28, 1969.*

Various imstruments intended for carbon monoxide measurements at car repair shops and inspection stations are reviewed. Drager tubes, applying powered absorbent, have the disadvantages of being inaccurate and slow in operation. Heat tone instruments, determining the CO-content as a function of the temperature rise due to the catalytic burning of unburned or partly oxidized constituents, are relatively unreliable since the correlation between the thermal effect and the CO-content is ambiguous. Experience showed that errors up to 2% by volume are possible. Instruments using the heat conductivity of the exhaust gases for CO-measurement are even more unreliable since different fuels have different thermal conductivities. Infrared instruments taking advantage of the different absorption spectra of different gases in infrared light, are suitable for rapid, accurate measurements. Four different simplified infrared instruments are described. Hartmann-Braun type CO-testers have condensate traps involving possible errors, as does the Bosch EFAW 215 type. Both instruments have electronic calibration. The measuring ranges of the CO-tester and the Bosch EFAW 215 instruments are 0-10% as well as 0-5% and 0-10%, respectively. The KFZ-Kompakt-UNOR instrument has a measuring range of 0-10%, calibration gas in separate tube, automatic flow control with indication, and condensate trap with automatic stop when error occurs. The MEXA-200 type instrument has two measuring ranges of 0-5% and 0-10%, flow indication, and separate condensate pump. It is designed for routine control purposes.

60368 **APTIC NO. 42486**

Mortstedt, S. -E., K.-E. Egeback, F. Karlsson, and R.-M. Egeback

MEASURING DIESEL ENGINE SMOKE BY MEANS OF BOSCH AND HARTRIDGE TYPE INSTRUMENTS. *(Matning av avgasrok fran dieselmotorer meg hjalp av Bosch- och Hartridge-atare). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-42, 17p., Sept. 1, 1969. 3 refs.*

Two different types of smokemeters were tested on diesel engines in chassis dynamometer tests to determine the accuracy and reliability of smoke measurements and the relation of Bosch to Hartridge units. The standard deviation for the Bosch instruments ranged from 0.1 to 0.25 Bosch units. The maximum error of the Bosch smokemeters was found to be less than plus or minus 0.5 units within a range of about 2 to 6 Bosch units with 90% probability. The accuracy of the Hartridge smokemeters was maximum for high smoke density. A maximum error of about plus or minus two units around 80 Hartridge units was obtained, while the error for 25 Hartridge units was about plus or minus five units. All test values showed normal ditribution. The correlation between Bosch and Hartridge units, established from 546 tests, was particularly good for low smoke densities. Leakage in the Bosch smokemeter filter and condensate in the pump hose and probe caused errors in some cases. Hartridge smokemeters, requiring regular cleaning and maintenance, should be used for stationary measurements only.

60369 **APTIC NO. 42498**

Walde, N.

MAPPING THE OCCURRENCE OF AUTOMOBILE EXHAUST THROUGH MEASUREMENTS OF THE CARBON MONOXIDE CONTENT IN CITY AIR. *(Kartlaggning av forekomsten av bilavgaser genom matning av koloxidhalten i stadsluft). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-44, 6p., Sept. 10, 1969.*

A systematic carbon monoxide measurement program which can also by applied for city and traffic planning purposes, is described. Carbon monoxide measurements are of great value since exhaust CO is present in the highest concentration of all exhaust components, and the actual concentrations are a measure of the global exhaust dispersion. Two different CO-measureing instruments with a measuring range of 0-300 ppm were tested. The instruments, equipped with a blending container, deliver one reading every minute, and 30 such readings are averaged to obtain a 30-min mean. The sampling is made through coarse and fine filters. The measuring station is best installed at a distance of about 20 m from an intersection, and up to one m from the curb. The sampling is made at a height of 1.5 to two m. A minimum test duration of about three weeks was found to be best. The tapes containing the recorded test data are sent to a central laboratory for processing in a computer. The mean values delivered by the computer are manually converted into CO contents on the basis of a calibration curve pertaining to the specific instrument. Fully automatic data processing is being planned.

60370 **APTIC NO. 42765**

Wark, D. Q. and D. T. Hilleary

ATMOSPHERIC TEMPERATURE: SUCCESSFUL TEST OF REMOTE PROBING. *Science, vol. 165:1256-1258, Sept. 19, 1969. 11 refs.*

The Nimbus III satellite carries the satellite infrared spectrometer. It measures the radiance of the earth and the atmosphere in seven narrow spectral intervals in the 15 micron carbon dioxide band and in one interval of minimum absorption at 11.1 micron. Seven simultaneous equations are solved to obtain the vertical temperature profile, while the eighth measurement is used to determine the boundary condition (cloud or surface temperature). Results agree with those obtained from conventional radiosondes. The quality of the satellite infrared instrument and to the very stable environment provided by the Nimbus spacecraft. (Author abstract modified)

60371 **APTIC NO. 43063**

National Aeronautics and Space Administration, Washington, D. C., Technology Utilization Office

CONDITIONING OF PULSES FROM AEROSOL PARTICLE DETECTORS. *Technical Support Package for NASA Tech Brief 69-10691. TSP 69-10691, 17p., 1969 (?).*

A pulse conditioner was developed which interfaces between an aerosol-particle detector and a commercial pulse height analyzer. Aerosol particle detection systems generate electrical pulses which have randomly occurring rise times, fall times, and durations on the order of tens of microseconds. The pulse conditioner must properly shape the pulses while processing the amplitude data linearly and over a wide dynamic range. The interfacing system detects the peak amplitudes of the input, stores a direct current voltage proportional to the input samples this dc voltage, and delivers a rectangular output/pulse. In designing and constructing this system, maximum use was made of integrated circuits: namely, operational amplifiers, digital logic elements, and high speed analog gates.

1968

60372 **APTIC NO. 42479**

Mortstedt, S. -E. and K. Boberg

REPORT ON TRAVELS MADE TO WEST GERMANY AND AUSTRIA NOV. 19-21, 1968. *(Reserapport - Tyskland och Osterrike den 19 - 21, November 1968). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-26, 9p., Dec. 17, 1968. 5 refs.*

A report on travels made to West Germany and Austria to study experiences gained there in the field of gasoline engine carbon monoxide measurements during idling is presented. No standards for gasoline engine emissions are being planned in Austria. Standards for new cars will come into force from Jan. 1, 1969 and July 1, 1969 for crankcase ventilation and carbon monoxide from idling cars, respectively, in West Germany, which will be followed by a corresponding standard for exhaust gases as measured according to the ECE-test as of Oct. 1, 1970. Carbon monoxide measurements, performed on a great number of cars in West Germany, gave values spreading from 0.5 to 12% by volume, with a mean of about 5% by volume. Corresponding measurements in Austria gave largely the same values, with a mean of about 5.5% by volume. Carburetor adjustments, performed on about 5000 cars of sic different models, resulted in a reduction of the average CO-content to 3.3-3.5% by volume. Idling CO control, which is expected to yield a reduction of about 20% in Austria, is one of the possible means of abating emissions from old cars. Simplified infrared instruments were used for carburetor adjustments at inspection stations and repair shops. Heat tone instruments, while involving errors, especially for low air-excess coefficients, were slightly superior to heat conduction type instruments.

60373 **APTIC NO. 83012**

Smith, Arvin H. and William J. Zolner

THE CHEMILUMINESCENT ANALYSIS OF GASEOUS AIR POLLUTANTS. *Preprint, Thermo Electron Corp., Waltham, Mass., Environmental Instruments Div., 18p., 1968. 1 ref.*

The basic operating principles of chemiluminescent nitric oxide analyzers are explained, and the Thermo Electron nitric oxide-oxides of nitrogen system is described in detail. The principle of operation of the Thermo Electron system is the chemiluminescent reaction of ozone with NO. A converter is employed for measurement of nitrogen dioxide to reduce the nitrogen dioxide to nitric oxide. These instruments are sensitive, accurate, and easily operated, and are used in automotive, stationary source, and ambient air monitoring. (Author abstract modified)

1967

60374 **APTIC NO. 80216**

Evans, William E.

DEVELOPMENT OF LIDAR STACK EFFLUENT OPACITY MEASURING SYSTEM -- PHASE I AND IA REPORTS -- DESIGN STUDIES. *Stanford Research Inst., Menlo Park, Calif., Proj. SRI 6529, Rept. SRI-6529-I-IA, 112p., July 1967. 5 refs.*

NTIS: PB-233 135

A design is presented for a portable pulsed ruby laser radar for remote measurement of the opacity of smoke plumes from industrial smoke stacks. The output of a ruby laser is split into two identical beams: one looking through the plume, the other kept in the clear. A two channel receiving system compares the clear air returns from the two beams on the far side of the plume to measure the two way attenuation of red light through the plume. Concurrent photographs are taken of the scene, with the points of measurement accurately marked. The equipment is designed for transport in and operation from a compact van at ranges of 100 to 400 m from the plume. The possibility of simplifying the system to a one beam mode is discussed and shown to depend on successful reduction of receiver saturation effects from the main plume signal. Those lidar performance characteristics likely to affect the lidar s accuracy as a transmissometer were measured. Methods of suppressing the main plume signal are described. The single beam technique was field tested by measuring the transmission of test targets and an oil fired smoke plume. Comparative transmission measurements were made using the conventional two ended technique, employing a tungsten light source filtered to a narrow band about the ruby wavelength. Lidar measurements of the test targets were in good agreement with conventional instruments. Tests on the smoke plume produced an unmeasureably small lidar signal attenuation. The general technique of single ended, single shot lidar transmissometry is feasible. (Author abstract modified)

60375 **APTIC NO. 42471**

Mortstedt, S. -E.

REPORT ON COLD AND HOT START TESTS. *(Rapport betraffande kall- och varmstart). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-7, BA-SSL-248, 5p., March 2, 1967. 2 refs.*

Laboratory control measurements concerning studies performed in the USA on automotive emissions after hot and cold starts were carried out. Investigations on the emissions after hot and cold starts in summer and winter, carried out in the USA, revealed a considerable and significant reduction in the emissions after hot starts. The ratio of the emissions after cold and hot starts in summer were 1.38 for carbon monoxide, 1.07 for nitrogen oxides, and 1.18 for hydrocarbons, while the respective ratios for CO, NOx, and HC in the winter were 1.91, 0.96, and 1.50. Swedish investigations, carried out on a Saab V4 model car at 5 C temperature revealed a ratio of 1.23 which is in good accordance with the above values. The investigations indicate that hot start and idling result in low CO and HC emissions, and that idling over 5 min corresponds to 1 min operation in city traffic, maximum. Cold start followed by idling causes, however, higher emissions, and the emission due to each cold start accounts for 10-12 min operation in city traffic.

1966

60376 **APTIC NO. 83418**

Grupinski, Leonard

EXPERIENCES WITH EMISSION MEASUREMENTS FOR DETERMINING SOLVENT AND HYDROCARBON VAPORS. *(Erfahrungen bei Emissionsmessungen zur Bestimmung von Loesemitteldaempfen und Kohlenwasserstoffen). Text in German. Wasser Luft Betrieb, 10(2):7780, 1966. 7 refs.*

Described are techniques for measuring solvent and hydrocarbon vapors on site with gas detector tubes or explosimeters and in the laboratory by gas chromatography or infrared spectroscopy. Whereas for on site determinations the components must be known, gas chromatographic analysis can detect quality and quantity in multicomponent systems involving light separation column exchange and rapid heating of column thermostats. In a flame ionization detector retention time and sensitivity as well as boiling points are examined for specific substances. Cases studied include kilns for coated sheet metal, automatic tumbling washers for metal parts, a continuous varnisher with infrared-heated kiln for pressurized products, a hardware factory and process smokestacks of refineries.

60377 **APTIC NO. 43065**

Hersch, Paul A.

METHOD AND APPARATUS FOR MEASURING THE CARBON MONOXIDE CONTENT OF A GAS STREAM. *(Beckman Instruments, Inc., Fullerton, Calif.) U. S. Pat. 3,258,411. 7p., June 28, 1966. 11 refs. (Appl. June 11, 1964, 13 claims).*

Because of the complexity of equipment involved, present techniques of carbon monoxide analysis are unsuitable where continuous monitoring of the gas is desirable in the interest of health and safety. This disadvantage is overcome by reacting CO in a gas steam with iodine pentoxide in a conversion chamber to produce iodine vapor. The iodine vapor is carried to a galvanic cell which is provided with an anode of active carbon and a cathode of inert conductive material joined by a neutral buffered electrolyte. When the iodine passes over or along the cathode, the carbon element is electrochemically oxidized. The free energy of oxidation of the carbon anode coupled with the reduction of iodine to iodide, is converted to electrical energy. The current generated in the cell is a measure of the rate of supply of iodine and is related to this rate by Faraday s law. The current generated is thus a measure of the rate of supply of CO in the gas sample stream. This method works continuously, does not require an external power source, needs no calibration or CO standard. A CO concentration below 50 ppm can be measured.

60378 **APTIC NO. 42476**

Walde, N.

REPORT ON THE TECHNICAL SYMPOSIUM ON AUTOMOTIVE EXHAUST EMISSION MEASUREMENTS AND REGULATORY REQUIREMENTS, HELD IN

GENEVA (SWITZERLAND), SEPT. 26-28, 1966. (Reserapport fran deltagande i Technical Symposium on Automotive Exhaust Emission Measurements and Regulatory Requirements, hallet i Geneve den 26-28 september 1966). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-4, BA-SSL-240, 15p., Oct. 10, 1966. 12 refs.

Experiences gained at a symposium on automotive exhaust emission measurements, held in Geneva, are presented. The USA68 test procedure is described. A changeover from cold to hot start tests would imply reduced carbon monoxide and hydrocarbon rates in hot cycles. Continuous nitric oxide measurements by means of infrared instruments are required, while some 70% of the total nitric oxide is converted into nitrogen dioxide for NO2 determination. Quality requirements on calibration gases and related problems are described. Various exhaust sampling systems and techniques are reviewed. Bag sampling involves certain changes in the sample composition due to reactions of nitric oxide and certain active hydrocarbons, as well as due to the solution of NO2 in the condensate. Emission reduction potentialities of induction system modifications are primarily related to improved carburetion conditions. A mobile laboratory operated in Munich, which is equipped with instruments for measuring both wind speed and direction as well as humidity, hydrocarbon, sulfur dioxide, and carbon monoxide emissions, is described.

1965

60379 **APTIC NO. 81089**

Donner, R. and Kh. Lohs

COBALT CHLORIDE USED FOR IDENTIFICATION OF ORGANOPHOSPHOROUS ESTERS ON PAPER- AND ESPECIALLY ON THIN LAYER CHROMATOGRAMS. *(Kobaltchlorid zum Nachweis phosphororganischer Ester auf Papier- und insbesondere Dunnschichtchromatogrammen). J. Chromatog., vol. 17:349-354, 1965. 12 refs. Translated from German, 8p.*

A solution of cobalt chloride in acetone was studied for the identification of organic phosphorus compounds, both on paper and thin-layer chromatograms. This reagent is compared to an ammonium molybdate and perchloric acid solution, iron (III)-salts, and methanolic chromium (III)-chloride solution. The sensitivity of detection with cobalt chloride as spray reagent depends not significantly on the adsorbent. Hexane-benzene-methanol (2:1:1) and hexane-methanol-ether (6:1:1) mixtures were investigated as solvents for various organophosphorus compounds. The use of the cobalt chloride solution in acetone also enables a quick and reliable identification of trialkyl phosphates. (Author abstract modified)

1963

60380 **APTIC NO. 82273**

IMMISSION MEASUREMENT. MEASUREMENT OF FLUORINE ION CONCENTRATION. *(Messung von Immissionen. Messung der Fluor-Ionen-Konzentration). Text in German. VDI (Ver. Deut. Ingr.) Richtlinien, no. 2452:1-7, Dec. 1963. 8 refs.*

A method is described for the measurement of fluoride ions using a sodium hydroxide-filled impinger; fluoride is then removed from the NaOH solution by steam distillation with sulfuric acid. Photometric analysis of the distillate for fluoride then follows. The solutions are described. This method detects hydrogen fluoride and silicon tetrafluoride, as well as fluoride ions in the air. (Author abstract modified)

1962

60381 **APTIC NO. 84347**

Pedinelli, Mario

PAPER CHROMATOGRAPHY OF MIXED LEAD ALKYLS AND OF GASOLINE CONTAINING THEM. *(Cromatographia su carta di piombo alchili misti e di benzine che li contengono). Text in Italian. Chim. Ind. (Milan), vol. 44:651-652, 1962. 12 refs.*

Tetramethyl lead, trimethyl-ethyl lead, methyl-triethyl lead, and tetraethyl lead were purified to obtain halogen salts which were treated at low temperature, followed by recrystallization of the alcohol. The descending method of chromatography was used: the substances, in an ammonia solution (butanol, ammonia, water), were placed about 1 cm below the crease in the paper. After about 2 hours, more solvent was added. The chromatogram reached about 30 cm in length, in the dark, at about 20 C. The solvent moved at about 2.2 cm/hr. Following drying, the chromatograms were sprayed with a developer substance (0.1% diphenylthiocarbazone in a chloroform solution). If, on the developed chromatogram, there were streaks only from the tetraethyl groups, then the presence of tetramethyl lead could be excluded. If there were streaks only of the tetramethyl groups, then only tetramethyl lead was present.

1956

60382 **APTIC NO. 40077**

May, M. L.

AIR POLLUTION CONTROL. *Instruments Automation, 29(5):908-909, May 1956. (Presented at the Conference on Instrumentation for Iron and Steel Industry, Pittsburgh, Pa., 1955.)*

The use of smoke recorders, dust control via electronic precipitators, hydrogen sulfide analyzers, and wind recorders by a steel plant to control and minimize plant effect on air pollution is described. The smoke recorder consists of a light source and a photcell actuated by the light beam and connected to an indicator and recorder. Waste gases interrupt the light beam, and the quantity of smoke present determines the amount of light energy which reaches the cell. When a predetermined smoke density is exceeded, a solenoid switch for the signal lights is actuated as an indication of excessive smoke emission. Dust loading is also analyzdd and recorded by photoelectric methods. The distribution of contaminants in the atmosphere is evaluated by a photoelectric cell after a sample is drawn through a filter paper on which the fine particulate matter is collected. Treated filter paper which undergoes a color change indicates hydrogen sulfide concentrations. An aerovane is utilized to determine wind direction and velocity.

1950

60383 **APTIC NO. 40339**

Brunetti, Cledo, P. L. Magill, and F. G. Sawyer

NEW DEVELOPMENT IN INSTRUMENTATION FOR ALL POLLUTANT STUDIES. *Interdepartmental Committee on Air Pollution, Washington, D. C., Air Pollut., Proc. U. S. Tech, Conf., Washington, D. C., 1950, p. 643-655. 9 refs. (May 3-5, Louis C. McCabe, ed.)*

Small portable electrostatic precipitators may be used for collecting particulate matter. A variation of this instrument adapted for continuous readings was built so that the collecting electrode was a rotating stainless steel plate partially immersed in a liquid bath. This instrument is useful for the collection of sulfuric acid mist from the air. A Sonkin cascade impactor is useful for collecting samples over short periods of time and for following changes in atmospheric pollution over longer periods. The operating principle of the thermal precipitator is discussed. The modified venturi scrubber offers the advantage of collecting in a relatively short time sufficient material from analysis, microanalytic methods, the emission spectrograph, and ultraviolet and infrared spectrometers are useful. Chemical identification of extremely small quantities of materials can be done with a protone scattering apparatus. A dust camera and photographic measurements. The collection and determination of ammonia, aldehydes, sulfur dioxide, and nitrogen oxides are also discussed. fur dioxide, and nitrogen oxides are also discussed.

AIR QUALITY MEASUREMENTS

1976

60384 **APTIC NO. 81099**

Dimitriades, Basil

PHOTOCHEMICAL OXIDANTS IN THE AMBIENT AIR OF THE UNITED STATES (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Environmental Sciences Research Lab., Program Element 1A1008, Rept. EPA-600/3-76-017, 192p., Feb. 1976. 170 refs.*

The problem of photochemical oxidant air pollution in the United States is reviewed. Specific topics covered include: the chemistry of oxidant formation; the effects of meteorological factors on oxidant formation; atmospheric levels of ozone, nitrogen dioxide, peroxyacetyl nitrate; the adverse effects of oxidants on human health, vegetation, and materials; atmospheric levels of oxidant precursors such as hydrocarbons and nitrogen oxides; models for the prediction of oxidant levels and emissions; methods for the control of oxidant precursors from mobile and stationary sources; control legislation; and the costs associated with the adverse effects of oxidants and methods for their control.

60385 **APTIC NO. 83062**

Farwell, S. O., E. Robinson, W. J. Powell, and D. F. Adams

SURVEY OF AIRBORNE 2,4-D IN SOUTH CENTRAL WASHINGTON. *J. Air Pollution Control Assoc., 26(3):224-230, March 1976. 26 refs.*

A survey of airborne 2,4-D pesticide south central Washington State was made during May-June 1973 and April-June 1974. The daily, 24 hr field samples were collected with differential impactor-impinger air samplers and were routinely analyzed in the analytical laboratory by electron capture gas chromatography. The high volatile, n-butyl 2,4-D ester represented 75% of the total chlorophenoxy herbicide burden in the representative air samples, even though none was legally applied in the counties adjacent to the vineyards. The predominant low volatile 2,4-D esters in the air samples were butoxyethanol and PGBE, whereas the amount of isooctyl was substantially less. On five different occasions there was a definite correlation between reported concentrations of airborne 2,4-D and the herbicide related damage to vineyards. There was little correlation between the 2,4-D application data for eastern Washington and days with relatively high concentrations of 2,4-D or times of extensive herbicide injury to non-target crops. A generalized weather model, which acts as both a transport mechanism and as a stabilizing influence on the diffusion in the lower layers of the atmosphere, was correlated to the period of high 2,4-D concentration in air over the lower Yakima Valley of south-central Washington. (Author conclusions modified)

60386 **APTIC NO. 82012**

Kleiner, Beth C. and John D. Spengler

CARBON MONOXIDE EXPOSURES OF BOSTON BICYCLISTS. *J. Air Pollution Control Assoc., 26(2):147-149, Feb. 1976. 5 refs.*

To study cyclist exposure to carbon monoxide, a bicycle instrumented with a portable CO monitor and recorder was ridden over 200 mi of metropolitan Boston streets. Routes commonly used by bicyclists were selected for the study. Typical summer exposures were between 11 and 15 ppm. The trips ranged from 10 to 45 min, and in no case did the trip averaged exposure approach 35 ppm. The CO exposures, even under the worst conditions, were always less than two thirds of the 1 hr ambient CO standard. Based on this experience, it appears unlikely that Boston bicyclists are subjected to dangerous levels of CO. Spatial and temporal variations in CO exposures were revealed. Using CO as an indicator of other transportation emissions, it proves to be a useful planning tool for reducing total exposure to a variety of pollutants. The specific recommendations for bicycle path planning are dependent on local urban characteristics of traffic loadings, street configurations, ventilation, and potential for bicycle deferable trips. Secondary arterials offering alternative routings between the same end points have as high or higher CO levels as do the main direct routes. Wider streets afford greater separation of cyclist from traffic and greater ventilation, both of which lower CO exposures. The practicality of portable CO monitoring has been demonstrated. (Author abstract modified)

60387 **APTIC NO. 81863**

Office of Air and Waste Management, Research Triangle Park, N. C., Monitoring and Reports Branch

MONITORING AND AIR QUALITY TRENDS REPORT, 1974 (ANNUAL REPORT). *Rept. EPA-450/1-76-001, 410p., Feb. 1976. 31 refs.*

NTIS: PB 252269/AS

A compilation of air quality monitoring data obtained by Federal, state, and local air pollution control agencies during the year 1974 is presented. The data are compiled according to the nation s 247 Air Quality Control Regions. Air quality data are provided for the five pollutants for which National Ambient Air Quality Standards exist, i.e., suspended particulates, sulfur dioxide, carbon monoxide, oxidants, and nitrogen dioxide. Analyses of pollutant trends are presented for the period 1970-1974. Nonurban ozone values over this period are also discussed. Particulates and CO showed a steady decline from 1970 to 1974. Sulfur dioxide fluctuated but ended the 5-year period with a 10% decline in terms of emissions from stationary source fuel combustion sources. Hydrocarbon emissions showed a small overall decline. Nitrogen oxides showed an increase of about 10% which was mainly due to motor vehicle emissions. (Author summary modified)

1975

60388 **APTIC NO. 81203**

Aizawa, Tatsu

ENVIRONMENTAL POLLUTION BY AUTOMOBILE TRAFFIC. *(Jidosha kotsu ni yoru kankyo osen). Text in Japanese. Koshu Eisei (Public Health), vol. 39:647-654, Sept. 1975. 17 refs.*

In Nagasaki City, a street with heavy traffic, and two residential locations were surveyed for effects of noise, carbon monoxide, and other environmental problems. In the residential areas, noise levels ranged from an average of 50 dB(A), to 64 dB(A) at the upper limit. On the heavily-travelled street, noise levels ranged from 60 dB(A) to 70 dB(A). When CO concentrations on the street were measured continuously for 24 hr, the range was 3.1-43.1 ppm (19.6 ppm, 24-hour average). In the two residential areas, ranges of CO concentrations were respectively, 0-11.7 ppm (3.7 ppm, 24-hour average) and 0-6.1 ppm (2.3 ppm, 24-hour average). Questionnaires distributed to about 1500 residents of the 3 surveyed areas, showed that 50% of those living on or near the heavily-travelled street complained about automotive emissions, noise, and vibrations, while about 3% in the residential areas had similar complaints. Complaints about catching colds easily ranged from 15-18% in the residential areas to 50% in the street region. When CO concentrations in the breath of nonsmokers from the street region were measured, average CO values were 10.4 ppm (range, 4.4-17.5 ppm) for men and 9.9 ppm (range, 3.0-23.1 ppm) for women. In both residential areas, average CO values were about 5 ppm for both sexes. The range of CO values for men was 3.0-9.6 ppm; while that for women was 2.5-12.9 ppm. Blood carboxyhemoglobin for both sexes, determined from Ringold s formula, average 2.5% (range 1-5%), for residents of the street, and 1.5% (range 1-3%), for those from the residential areas.

60389 **APTIC NO. 82585**

Angell, J. K. and K. Korshover

GLOBAL ANALYSIS OF RECENT TOTAL-OZONE FLUCTUATIONS. *Preprint, National Oceanic and Atmospheric Administration, Air Resources Labs., 43p., April 1975. 13 refs.*

Total ozone data for various regions of the world were examined on a mean seasonal and annual basis. An increase in total ozone observed during the 1960 s appears to have ended. A significant (2%) reduction in ozone between 1970 and 1974 at United States and British stations occurred, although the annual rate of decrease diminished from 0.8% between 1971 and 1972 to 0.2% between 1973 and 1974. The 2% reduction in the United States returned the total ozone value almost to its 1963 level. The decreases in Great Britain and at Huancayo, Peru amounted to only one-third and one-fifth, respectively, of the increases during the 1960 s. The existence of a quasi-biennial oscillation in total ozone which is variable in phase, amplitude, and period makes the detection of any effect on the ozone shield due to the large Russian nuclear explosions in 1961 and 1962 extremely difficult. These nuclear tests do not appear to have reduced the hemispheric total ozone amount by more than 1-2% on a seasonal or annual basis. There is also no evidence of a decrease in total ozone over Japan during the passage of radioactive clouds following individual Chinese tests in 1968, 1969, and 1970. A coincidence of the break-down of the quasi-biennial oscillation in total ozone at Aspendale and Brisbane during the eruption of Mount Agung during the spring of 1963 was observed. Southern hemisphere ozone values appeared to be anomalously high following the eruption, but the lengthening of the period of quasi-biennial oscillation during this time period may have influenced or dominated the results. There is also evidence that a decrease in total ozone between 1970 and 1974 may be associated with a decrease in sunspot number following the sunspot maximum in 1969. (Author abstract modified)

60390 **APTIC NO. 82248**

Boersma, M. A. M.

CATALYTIC AFTERTREATMENT OF AUTOMOTIVE EXHAUST GASES. 1. AIR POLLUTION BY AUTOMOBILE EXHAUST GASES: CAUSES AND MEASURES TOWARD THEIR REDUCTION. *(Katalytische nabehandeling van uitlaatgassen. 1. Luchtverontreininging door automobieluitlaatgassen: oorzaken en maatregelingen ter vermindering). Text in Dutch. Polytech. Tijdschr., Ed. Procestechniek (The Hague), 30(11):356-362, May 28, 1975.*

Air pollution due to automobile exhaust gas is discussed. A major component of these gases is carbon monoxide, which has a 200-300 times greater affinity for hemoglobin than has oxygen. A comparison of the average carbon monoxide concentrations in some European and U. S. cities found the following (carbon monoxide in ppm): Paris, 18.5; Munich, 18; Frankfurt, 15; Chicago, 32; Washington, 23; Denver, 20; and Philadelphia 25. The second component for consideration is the hydrocarbon content, which includes such carcinogens as 3,4-benzopyrene, 3,4-benzofluoroanthrene, dibenzopyrene, and dibenzoanthracene. The average atmospheric hydrocarbon content of some U. S. cities is reported as follows (hydrcarbons in ppm): Chicago, 2.7; Washington, 2.1; Denver, 2.5; and Philadelphia, 2.2. The third component of automobile exhaust is nitrogen oxides formed by the thermal oxidation of atmospheric nitrogen. The average atmospheric nitrogen oxides concentration of some U. S. cities is as follows (nitrogen oxides in ppm): Chicago, 0.043; Washington, 0.034; Denver, 0.036; and Philadelphia, 0.036. Various test methods and legal regulations are compared.

60391 **APTIC NO. 79802**

Brosset, Cyrill

DETERMINATION OF AIR-BORNE ACIDITY WITH SOME EXAMPLES ON THE ROLE OF ACID PARTICLES IN ACIDIFICATION. *Swedish Water and Air Pollution Research Lab., Gothenburg (Sweden), Rept. B 226, 21p., June 1975. 14 refs.*

The acid properties of particles were investigated by measuring the content of mainly strong acid in leaching solutions of particle samples and in drain water from trees. A titration procedure based on Gran s plot was developed, which enables the determination of stronger acids. The water soluble fraction of particles consists mainly of more or less acid ammonium sulfates. A preliminary experiment was carried out regarding the concentrations of hydrogen ion, ammonium ion, and sulfate ion in drain water from spruces. The ratios among these ions are compared with those observed in the leaching solution of particles sampled during the same time interval. Particulates containing more or less acid ammonium sulfate may be of secondary importance as regards the acidification of land and lakes caused by wet deposition. Dry deposition of particles on coniferous trees with subsequent secondary reactions and washout apparently can result in large depositions of acid on the ground level beneath the trees. (Author abstract modified)

60392 **APTIC NO. 79208**

Calvert, Jack G.

REPORT TO THE COORDINATING RESEARCH COUNCIL ON A PRELIMINARY ANALYSIS OF THE CHEMICAL ASPECTS OF THE DATA FROM LARPP OPERATION NO. 33 OF NOVEMBER 5, 1973. *Preprint, Ohio State Univ., Columbus, 60p., 1975 (?). 12 refs.*

Air monitoring and meteorological data obtained during studies of photochemical smog formation in the Los Angeles area are presented. Ozone levels of about 0.05 ppm are presented in the early morning (0755 hr) at an altitude of about 800 ft. A general decline in the ozone level occurs with the insertion of nitric oxide resulting from morning rush hour traffic in the area. Turbulent mixing of ozone, NO, and nitrogen dioxide in the smog mixture is quite effective from the 200-800 ft altitude level at 1000 hr in the morning. The ratio of the ozone concentration multiplied by the NO concentration to the NO2 concentration as obtained from the experimental data is higher than that expected from theory. No correction, however, is made for ultraviolet attenuation which obviously occurs during the midday hours. Hydrocarbons, carbon monoxide, aldehydes, and other oxidation products of hydrocarbons appear to play an important role in reactions which convert NO to NO2. Ozone formation mechanisms appear to be essentailly correct and useful for modeling ozone levels with a knowledge of only the NO/NO2 concentration ratio and the solar irradiance in the NO2 absorption region.

60393 **APTIC NO. 83547**

Carty, C. and R. R. Colwell

A MICROBIOLOGICAL STUDY OF AIR AND SURFACE WATER MICROLAYERS IN THE OPEN OCEAN. *J. Wash. Acad. Sci., 65(4):148-153, Dec. 1975. 18 refs.*

A microbiological study was made of air and surface water microlayers in the open ocean to determine whether the bacteria found in air over the open ocean are of marine or terrestrial origin. Samples were taken along tracklines running from Balboa, Panama to the Galopogos Islands, and from the Islands to Guayaquil, Ecuador during Feb. 1974. The total viable, aerobic, heterotropic bacterial populations decreased in direct relation to distance from land. The predominant bacterial isolates in water were marine species of the genus Pseudomonas, whereas the most commonly isolated bacteria from air samples was Bacillus spp., lending support to the theory of terrestrial origin of microorganisms in the air over the open ocean. (Author abstract modified)

60394 **APTIC NO. 80363**

Chock, D. P., T. R. Terrell, and S. B. Levitt

TIME-SERIES ANALYSIS OF RIVERSIDE, CALIFORNIA AIR QUALITY DATA. *Atmos. Environ., 9(11):978-989, 1975. 11 refs.*

Air quality and weather data from Riverside, California, were analyzed. A univariate analysis of the weekly averages of the daily maxima of oxidant, carbon monoxide, nitrogen dioxide, and total hydrocarbons from August 1964 to June 1972 was performed. Total hydrocarbons decreased by 3.2%/yr while CO increased by 7.4%/yr. This is contrary to what was expected, and to values measured in Los Angeles. This anomaly may be due to an as yet undetermined change in the CO measurements, whose yearly average showed a sudden increase of 3 ppm (35%) after June 1969. Oxidant had an increasing trend of 3.7%/yr while NO2 decreased by 1.6%/yr. This may be attributed to the increasing nitric oxide to HC ratio of the emission sources, which would shift the oxidant peak further east, downwind from Los Angeles, and also slow down the morning NO2 produced locally in Riverside. Due to the limitations of the data, only the relationships between the weekly averages of the daily maxima of oxidant and the weekly averages of several weather parameters were investigated. High serial correlations in the error term necessitated the use of models other than the ordinary least squares analysis. The Aitken s model, the lagged model, and the transfer function models were investigated. All models provided consistent values for the estimated powers of the three most important weather parameters: radiation intensity, wind speed, and temperature. Their effect was multiplicative. (Author abstract modified)

60395 **APTIC NO. 83975**

Chyba, Andrzej

ODOR THRESHOLDS OF AIR POLLUTANTS. *(Progi zapachu substancji zanieczyszczajacych powietrze atmosferyczne). Text in Polish. Gaz, Woda Tech. Sanit. (Warsaw), 49(9):280-285, Sept. 1975.*

The measurement of odors at emission sources and in the atmosphere is discussed on the basis of findings in the literature. Teams of at least 3 people participate in level identifications at emission sources, taking samples of about 100 cu cm. Atmospheric testing involves approximately 100 affected individuals; the type of odor is determined, measurements are taken at fixed times, and the results obtained are analyzed statistically on a periodic basis to determine the origin, intensity, and range of the pollutants. Results vary depending upon local conditions, techniques, apparatus, and evaluation. Soviet research has shown experimentally measured pollutant thresholds to be an important hygienic parameter. Threshold values of odors of certain substances are listed.

60396 **APTIC NO. 84135**

Davila, Guillermo H.

JOINT PROGRAM ON AIR POLLUTION SAMPLING IN CITIES ALONG THE U. S. - MEXICAN BORDER. *(Programa conjunto de muestreo de la contaminacion del aire en ciudades fronterizas de Mexico y los Estados Unidos de America). Text in Spanish. Bol. Ofic. Sanit. Panam., 57(6-7):290-296, Oct. 1975.*

The deterioration of air quality was investigated since 1972 in neighboring cities on the U. S. - Mexican border: Ciudad Juarez (Chihuahua), El Paso (Texas), and La Cruces (New Mexico), considered within the same environmental system and comprising an area of 50 miles radius. Dust pollution studies were carried out by means of weekly determinations made with high volume filters installed in the three regions under investigation. The tabulated results are reported in microgram/cu m and evaluated with reference to U. S. Federal Norms on environmental dust (which must not exceed a yearly average of 75, and a maximum of 260 mg/cu m/24 hr). A serious dust pollution problem in the three areas sampled (commercial; commerical-residential; residential) in Ciudad Juarez and El Paso was found between March and December 1972. The results in Donna Ana county of New Mexico (towns of Las Cruces and Anthony) and in Clint (El Paso county, Texas) between October 1972 and February 1973 were closer to the established norms. The pollution caused by sulfur dioxide was measured by means of sulfuration plates installed in 20 locations of El Paso and Cindad Juarez and exposed for 30 days (February 1st - March 2nd, 1972). The results reported as microgram SO2/sq m/day, showed a minimum of 1.0 and a maximum of 7.2 (median 3.1111) among 18 stations of Ciudad Juarez (2 out of 20 stations were destroyed), and 0 and 3.48 (median 1.5045) in El Paso. All studies were carried out in accordance with norms established in a Bases of Collaboration document devised by the local health authorities in collaboration with the Pan-American Health Organization and World Health Organization. The results are considered satisfactory. Further investigations are planned and other cities are expected to join the program.

60397 **APTIC NO. 84625**

Ebisawa, E.

SUMMARY OF AIR POLLUTION SURVEY. *(Taiki osen chosa no gaiyo). Text in Japanese. Ibaraki-ken Kogai Gijutsu Senta Nenpo (Annu. Rept. Environ. Pollut. Res. Center, Ibaraki Pref.), no. 7:17-19, Oct. 1975.*

An air pollution survey in Ibaraki Prefecture is summarized. There were 22 monitoring stations for sulfur dioxide and airborne particulates, and 16 stations for nitrogen oxides and oxidant measurements. Photochemical smog emergency warnings were issued 34 times, while forecasts of photochemical smog emergency were issued 71 times. Seventeen complaints claiming oxidant damage were filed. The damage to morning glory by photochemical smogs and the damage to plant leaves by fluorides were investigated. Visible damage to plant leaves was observed at some places near an aluminum treatment factory, and 95 ppm to 48 ppm fluoride was detected. Damage to the morning glory was observed at Kashima City and Mito City and the damage occurred with 0.16 ppm oxidant level at Kashima City and with 0.12 ppm oxidant level at Mito City.

60398 **APTIC NO. 84384**

Ellsaesser, Hugh W.

THE UPWARD TREND IN AIRBORNE PARTICULATES THAT ISN T. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 235-269. 133 refs.*

Data relating to natural and anthropogenic particulate emissions and trends in atmospheric turbidity are reviewed, and it is estimated that man now contributes 13.6% of the 3.5 billion tons of primary and secondary particulates presently emitted annually. Values derived for the anthropogenic effect on the trend in total airborne particulates (if assumed monotonic) range from 0.06-0.4% increase/yr. This effect is only marginally detectable, and the much larger rates of increase published in the literature are probably due to local or temporary effects rather than being representative of a global trend. Moreover, almost all urban areas are showing a measurable improvement in particulate loading and visibility, suggesting that the upward trend in anthropogenic particulate emissions no longer exists and may even be reversed. (Author abstract modified)

60399 APTIC NO. 82633

Farmer, C. B., O. F. Raper, and R. H. Norton

SPECTROSCOPIC DETECTION AND VERTICAL DISTRIBUTION OF HCL IN THE TROPOSPHERE AND STRATOSPHERE. *Preprint, California Inst. of Tech., Pasadena, Jet Propulsion Lab., 15p., 1975. 17 refs.*

Hydrogen chloride was detected in both the troposphere and stratosphere by ground-based and airborne spectroscopic measurements of the 1-0 band at 3 microns wavelength. A decreasing mixing ratio with altitude was observed in the troposphere, and a rapid increase with altitude was observed in the lower stratosphere for the HCl molecule in the gas phase. The maximum HCl concentration in the stratosphere was observed at an altitude above 21 km (the limiting height of the observations to date). The local value for the volume mixing ratio at 21 km was 7 + or - 1 times 10 to the -10. However, the zenith column abundance observed above 21 km implied that the mixing ratios at greater altitudes are unlikely to reach values much in excess of the local value at 21 km. (Author abstract modified)

60400 APTIC NO. 82796

Feeney, P. J., T. A. Cahill, R. G. Flocchini, R. A. Eldred, D. J. Shadoan, and T. Dunn

EFFECT OF ROADBED CONFIGURATION ON TRAFFIC DERIVED AEROSOLS. *J. Air Pollution Control Assoc., 25(11):1145-1147, Nov. 1975. 10 refs.*

Aerosols present upwind and downwind of freeways in the Los Angeles Basin were collected by Lundgren impactors with afterfilters over five particle size ranges in an effort to determine the effect of roadbed configuration on traffic-derived aerosols. The contribution of freeway traffic to total airborne particulate load was established by subtracting the local background which was measured with an upwind sampler from the values obtained by downwind samplers on a size by size and element by element basis. The contribution of traffic to aerosol load correlated reasonably well with estimates derived from automotive and roadbed expendable rates. Traffic-derived aerosols, normalized to vehicular flow, were considerably lower in mass at locations downwind of depressed roadbed configuration than they were at either raised or at-grade configurations. A line source model combined with literature values for emitted lead produced good agreement with results obtained for the at-grade configuration. (Author abstract modified)

60401 APTIC NO. 80244

Fix, Jack J. (Comp.)

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1974. *Preprint, Battelle Memorial Inst., Richland, Wash., Pacific Northwest Labs., 3p., April 1975.*

NTIS: BNWL-1910

Air monitoring data for sulfur dioxide, nitrogen dioxide, and suspended particulate levels are presented for the Hanford, Washington area. The highest yearly average concentration of NO2 measured was 0.006 ppm, or 12% of the ambient air standard of 0.05 ppm. Suspended particulates fluctuated widely due to occasional heavy dust storms; values ranged from 8-572 micrograms/cu m with an annual average of 57 micrograms/cu m. All SO2 results were less than the detection limit of 0.005 ppm, or 25% of the ambient air standard of 0.02 ppm.

60402 APTIC NO. 84715

Fujie, Kimiko

SUSPENDED PARTICULATES IN OSAKA CITY. *(Daitoshi ni okeru taiki fuyu ryushijo bushitsu ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(3):92-106, 1975. 13 refs.*

Suspended particulates were collected by high volume air sampler at 5 to 7 sites in Osaka City from 1966 to 1973. The concentrations of suspended particulates, sulfates, nitrates, metals and benzo(a)pyrene were measured. The size distribution of particulates collected by Andersen high volume sampler was also determined. Concentrations have been reduced since the year 1969, when they were maximum. The pollution level has become similar in every area of Osaka except the western seaside industrial area. This variation was considered to be produced by the high concentration. Regional pollution was decreased by emission source control for large factories and pollution sources were scattered from city-center to the outskirts by mobile traffic. Epidemiological analysis made it clear that the level of compound pollution by sulfates and suspended particulates had an effect on human health throughout Osaka City. The factor analysis method was applied to air pollution from suspended particulates in Osaka. Three common factors were obtained from 18 to 20 items of data. They were the factory, the automobile, and the component of pollutants. Further, factor scores were obtained at each sampling site. Consequently, the hypothesis of these factors agreed well with actual pollution in sampling areas. In addition to the indices that are already known, the following parameters obtainable from factor analysis at this time include the amounts of pollutants emitted from small and medium-sized factories and those exhausted by automobiles as factors of emission source, sulfates and vanadium in suspended particles as a factor of the concentration of environmental quality, and the absence rate of schoolchildren due to respiratory diseases as the factor of effect on the human body.

60403 APTIC NO. 81516

Fujii, Tetsu and Kiyoshi Imamura

STUDIES ON AIR POLLUTION CAUSED BY PHOTOCHEMICAL REACTIONS (4) OCCURRENCE CONDITIONS OF PHOTOCHEMICAL SMOG IN OSAKA (III). *(Kokagaku hanno ni yoru taiki osen ni kansuru kenkyu (4) Kokagaku sumoggu no hassei joken (III). Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):1975. (Presented at the Japan Society of Air Pollution Meeting, Annual 16th, Nov. 5-7, 1975.) Translated from Japanese, 3p.*

Conditions over the occurrence of high concentrations of photochemical smog over Osaka Prefecture were investigated using data from a three-dimensional distribution survey and a vertical meteorological distribution survey with respect to the concentrations of nitrogen oxides, sulfur dioxide, aerosols, hydrocarbons, and ozone. The ground level ozone concentration increased when ozone at high altitudes was carried by wind to an altitude low enough to permit convection currents to reach it. The ozone concentration showed a close correlation with NO2, SO2, and aerosol concentrations. Hydrocarbon discharges from pollution sources appeared to extend over a comparatively wide area of the atmosphere.

60404 APTIC NO. 82268

Fujimura, Mitsuru and Yoshikazu Hashimoto

SIZE DISTRIBUTION OF THE AIRBORNE PARTICULATES BY ANDERSEN SAMPLER, PART 2. *(Andasen sanpura ni yoru fuyuryushi no ryudo bunpu sokutei, 2). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):357, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 103.)*

The particle size distribution of the airborne particulates collected by an 8 stage Andersen sampler is described. A two-peak pattern was observed for the particle size distribution, with peaks located in the vicinity of 0.5 micron and 4 micron, depending upon sampling location, season, and climate. The particle size distribution by individual elements showed three distinct patterns: those having only one peak, those with two peaks, and those with no peak. The first pattern was shown by aluminum, calcium, magnesium, titanium, and rare earth elements, the second pattern was shown by sodium, manganese, and vanadium, and the third pattern was shown by bromine, arsenic, selenium, and antimony.

60405 **APTIC NO. 82348**

Fukuda, Masanori and Katsunori Honma

ON COMPOSITION OF THIN IRON FILM CORROSIVE AIR POLLUTANTS. ***(Tetsu usumku fushokusei taiki osen ryushijo busshitsu no sosei ni tsuite). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 15-17, 1975. (Presented at the Japan Chemical Society Power Symposium, 13th, Nov. 19-21, 1975.)***

Suspended particulates in photochemical smog are known to be extremely corrosive. A thin layer of iron was vacuum vapor deposited on polyester film, and corrosive particulates were collected. The elementary composition of particulates and the sulfur content were determined using an energy dispersive X-ray micro analyzer (EXMA) attached to a scanning electron microscope. Photochemical smog particulates were often acidic jellies, readily corroding iron, copper and silver. Results by EXMA clearly indicated the presence of S and suggested the presence of organic S compounds. Particulate concentrations were determined in terms of the light transmittance of the corroded iron film; the hourly variation was also measured. The composition of particulates in the center area and outer area impacted on the thin iron film were analyzed by EXMA, which indicated that particulates containing S were relatively small. The direct determination of sulfate concentration in particulates in terms of energy intensity measured by EXMA was also attempted.

60406 **APTIC NO. 76575**

Fushimi, Katsuhiko and Kiyoshi Kawamura

ON ATMOSPHERIC CO OBSERVATION RESULT IN MINAMI-TORISHIMA ISLAND. ***(Minami Torishima ni okeru taiki CO no kansoku kekka ni tsuite). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p 87, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975, Paper 218.)***

The atmospheric carbon monoxide at an island in the western Pacific Ocean was measured to aid the study of global pollution distribution, using a newly developed CO analyzer. The CO analyzer employed the reaction between CO and mercury proposed by S. Robbins of the Stanford Research Laboratory, in which the air sample is passed through 0.3 g mercury oxide at 190 C and the absorption of the liberated Hg is measured. The 13-day average CO level from 7 am to 6 pm was 0.15 ppm, and the 7-day average from 6 pm to 7 am was 0.13 ppm. The observed CO levels were within the reported CO levels measured at other two locations of similar latitude (24 deg north) in the Pacific Ocean. The difficulty of the CO analyzer was the required 7 min time lag until the analyzer indicated the CO level of the sample after the flow line was switched from the calibration gas line to the air sample line.

60407 **APTIC NO. 84188**

Gatayama, Testuya, Masayoshi Okamoto, and Hiroyoshi Yoshida

TIME SERIES ANALYSIS BETWEEN OZONE AND NITROGEN OXIDES IN AMBIENT AIR. ***(Taikichu no ozon to chisso sankabutsu tono sokan kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):273, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 10.)***

The correlation of the atmospheric ozone level with the nitrogen dioxide and nitric oxide levels in Kawasaki City is described, based on measurements made in May, August, November, and December. The one-hour average level of nitrogen oxides was similar for all months investigated, and it ranged from 8 to 20 pphm. The NO level was high from 8 am to 10 am and 8 pm to 2 am, while the NO2 level was low during the night and high during the day, especially the hr between 6 am and 12 pm. The NO2 level during the day reached 1.3 to 4 time the NO level. The correlation of the NO level with the day s maximum ozone level was highest 1 to 4 hr before the occurrence of the day s maximum ozone level. The correlation factor was - 0.6 in May and November. The correlation of the NO2 level with the day s maximum ozone level was highest 2 to 3 hr before the occurrence of the day s maximum oaone level; the correlation factor in May and August was 0.4 to 0.1, respectively.

60408 **APTIC NO. 84196**

Georgii, H. W.

LONG-TERM ASPECTS OF THE REGIONAL IMMISSION SITUATION IN THE LOWER MAIN AREA. *(Langfristige Aspekte der regionalen Immissionssituation im Untermaingebiet). Text in German. Chem.-Ing.-Tech., 47(22):939-940, 1975. 6 refs.*

The present status and development of air pollution were examined in the Lower Main Region with the objective of projecting future trends. Sulfur dioxide concentrations over a period of 13 yr were studied as a function of emission factors and meteorological parameters. The findings were compared with those obtained in the Ruhr area. Sulfur dioxide was selected as the most widespread pollutant, aside from carbon monoxide. The long-term trend of SO2 concentration started with a maximum in 1963/64, receded intermittently from 1966-69 and has increased slightly since then. The changes observed over the period indicated could be attributed to a continuously increasing automobile traffic density. The relation between emission and pollution can be quantified by the correlation coefficient. It amounted to 0.75 for the parameter combination of total emission to atmospheric SO2 pollution concentration based on yearly averages and 0.82 for domestic heating emission to SO2 concentrations. General meteorological situations and air mass properties did not reveal significant correlations with atmospheric SO2 concentration. The best correlations were found during northeasterly to easterly winds. Higher wind velocities, turbulence and a better spread of industrial pollution could be the reason why southwesterly winds did not cause SO2 concentration increased within the Frankfurt area although major industrial complexes were located in the southwest and west of the city. In all probability, SO2 accumulations in the Frankfurt Region were due to low-speed easterly winds showing a cumulative effect of emission rate and meteorology on high SO2 pollution values. Compared to Frankfurt, a similar SO2 concentration trend was determined for the Ruhr area where the pollutant level depended more on emission than on meteorological factors. A projection for 1980 for Frankfurt indicated mounting SO2 emission with higher energy consumption (fossil fuel, high S content of crude oil) even with 90% desulfurization of smoke and 1% S content of coal. It can be expected with due reservation that the tendency toward decreased SO2 pollution in the 70 s would not continue although the results obtained for the Frankfurt Region should not be generalized.

60409 **APTIC NO. 80328**

Hidy, George M., Bruce R. Appel, Robert J. Charlson, William E. Clark, Sheldon K. Friedlander, Dale H. Hutchison, Theodore B. Smith, J. Suder, Jerome J. Wesolowski, and Kenneth T. Whitby

SUMMARY OF THE CALIFORNIA AEROSOL CHARACTERIZATION EXPERIMENT. *J. Air Pollution Control, Assoc., 25(11):1106-1114, Nov. 1975. 12 refs.*

Field observations from the California Aerosol Characterization Experiment (ACHEX) are summarized. Aerosols accompanying photochemical smog were studied intensively in the Los Angeles Basin during the period between July and Oct. 1973. The observations cover a wide variety of parameters including physical and chemical properties of aerosol, pollutant gas concentrations, and meteorological variables. Sulfate, nitrate, noncarbonate carbon, and liquid water are important to the mass concentration of airborne particles and their relation to reduction in visibility. The anthropogenic contribution to atmospheric aerosols is allocated primarily to the submicron or fine particle size range. (Author abstract modified)

60410 **APTIC NO. 79151**

Hinds, B. D., R. F. Kimberlin, III., and G. B. Hoidale

BOUNDARY LAYER DUST OCCURRENCE. I: ATMOSPHERIC DUST OVER THE WHITE SANDS MISSILE RANGE, NEW MEXICO AREA. *Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., Army Task 1T161101A91A2011, Rept. ECOM-DR-75-2, 69p., April 1975. 31 refs.*

A review of studies on atmospheric dust over the White Sands Missile Range, New Mexico area is presented. Dust occurrence and visibility data are presented for the White Sands Weather Station and the Holloman Weather Station over the period 1960-1973. Blowing dust (resulting in a visibility of less than 11 km) occurred an average of 13 times per year at the WSWS and 30 times per year at the HWS. The highest frequency of occurrence of blowing dust at the WSWS was 4%, and that at HWS was 9%. Both peaks occurred during late afternoon in April. Dust storms (resulting in a visibility of less than 1 km) occurred an average of once per year at the WSWS and six times per year at the HWS. The frequency of occurrence patterns for various durations of blowing dust at the WSWS and the HWS were similar, with short durations predominating in the summer and long durations in the spring. (Author summary modified)

60411 **APTIC NO. 84666**

Hirose, Kai, Shinichi Yamanaka, and Susumu Takada

MONTHLY VARIATIONS OF HYDROCARBON CONCENTRATIONS IN THE URBAN ATMOSPHERE. *(Taikichu tankasuiso no tsunen chosa kekka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):586, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 317.)*

Trends in the presence of atmospheric hydrocarbons in Kyoto were studied. Samples were collected on a gas chromatography column cooled by liquid oxygen and analzyed by gas chromatography. The composition of hydrocarbons was the same throughout most of the year, but the relative concentrations varied. The dominant hydrocarbons were ethane, ethylene, propane, propylene, n-butane, n-hexane, benzene, and toluene. Hydrocarbons suitable for photochemical reaction, such as propylene, isobutene, and toluene were always found. Trichloroethylene and dichloroethane were often detected. The level of total hydrocarbons and oxidants from October through March was lower than the rest of the year, indicating the presence of photochemical reactions from October through March.

60412 **APTIC NO. 82599**

Hofmann, D. J., J. M. Rosen, J. M. Kiernan, and Jean Laby

STRATOSPHERIC AEROSOL MEASUREMENTS IV: GLOBAL TIME VARIATIONS OF THE AEROSOL BURDEN AND SOURCE CONSIDERATIONS. *Wyoming Univ., Laramie, Dept. of Physics and Astronomy and Univ. of Melbourne, Melbourne (Australia), Dept. of Physics, Office of Naval Research Contract N00014-70-A-0266-0005, Rept. GM-29, 38p., May 1975. 20 refs.*

Balloon-borne measurements of the stratospheric sulfate aerosol from late 1971 to mid 1974, a period of minimal new volcanic activity, at stations ranging from 85 deg North to 90 deg South were used to study the global spatial and temporal aerosol variation, aerosol source considerations, and the sulfur dioxide budget. There was no significant difference in the aerosol loading between the northern and southern hemispheres. Asymmetries in the seasonal variation of the total loading appeared to correspond to seasonal asymmetries in tropopause height. A slow decay in the total aerosol loading during 1972 and 1973 following an apparent injection in late 1971 appeared to be global in nature, suggesting that a transient phenomenon such as a volcanic eruption was the primary source of sulfate aerosol or SO2 for stratospheric aerosol formation. Budget considerations and model calculations favored a larger injection of SO2 than would be expected from a quasistatic natural exchange of tropospheric air. (Author conclusions modified)

60413 **APTIC NO. 80365**

Hudson, J. L., J. J. Stukel, and R. L. Solomon

MEASUREMENT OF THE AMBIENT LEAD CONCENTRATION IN THE VICINITY OF URBANA-CHAMPAIGN, ILLINOIS. *Atmos. Environ., 9(11):1000-1006, 1975. 24 refs.*

Atmospheric lead concentrations were measured as a function of both time and position in a rural area adjacent to Urbana-Champaign, Illinois. The results were related to traffic and meteorological data with the use of a mathematical model for the transport of lead particulates from local sources. Data for traffic patterns on both city streets and rural highways, stability class, and wind direction and speed were used on an hourly basis. The terrain in the area is flat, and there is only one major local source of lead, the automobile. The mean rural concentration is 0.227 microgram/cu m with a standard deviation of 0.116 microgram/cu m. The lead levels fall off slightly with increasing distance from the urban area. The contribution of lead emitted from local highways and urban areas to the rural atmospheric levels is small. Most of the lead is carried into the region by the wind from distant sources. Measurements were also made of particle size distributions and rates of deposition to the ground. (Author abstract modified)

60414 **APTIC NO. 76636**

Inoue, Kaori, Kenji Oka, Keisuke Taguchi, Nobuko Tajima, Yoshio Tsujino, Yoshinori Nishikawa, Hiroshi Hatanaka, and Ken-ichiro Yoshimura

CONCENTRATIONS OF AMBIENT LIGHT HYDROCARBONS IN SAKA-SEASIDE INDUSTRIAL AND SUBURBAN AREA. *(Sakai, Rinkai konbinato shuhen no tei futten tankasuiso nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(3):121-134, 1975. 1 ref.*

Concentrations of 11 low boiling point hydrocarbons were measured at the site adjacent to the west of Sakai seaside petrochemical complex and at Shinkanaoka 6 km to the east. Samples were collected every one hour for 24 hrs for four days in May and three days in July 1974. Concentrations of each component were determined by gas chromatography. The composition of HC concentrations varied greatly from day to day, and no specific diurnal patterns were observed. The mean concentration was generally in the range of several ppb. Concentrations of ethylene, propane and n-butane were higher than those of ethane, acetylene, propylene, i-butane, i-pentane and n-pentane. Concentrations of l-butene and i-butene tended to be lower. The concentration distribution, relationship to wind direction, and correlations between HCs were also analyzed. The abnormally high propane concentration of 176.4 ppb and results of this investigation point to the fact that a large amount of HC is discharged periodically from the petrochemical complex.

60415 **APTIC NO. 82358**

Inouye, Rikita and Yuji Watanabe

STATISTICAL PROPERTIES OF SULFUR OXIDES CONCENTRATIONS AT CONTINUOUS MONITORING STATIONS IN JAPAN (II). *Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(3):111-120, 1975. 7 refs.*

A mathematical model for estimating the properties of frequency distributions of air quality data was developed. If the frequency of the pollutant concentration sampled by any averaging time is assumed to follow a log-normal distribution, it is possible to calculate any percentile value. Furthermore, if the form of the geometric mean can be determined as a function of the averaging time, it is possible to predict all values of the arrowhead chart for concentrations of that pollutant. A case study was conducted with sulfur oxides concentrations observed in Sapporo and Muroran. The geometric mean followed a general law involving the sampling time, which was 1 year in this case; the arithmetic mean; and the geometric mean calculated with 1-hour averaging time, which had a linear relationship with the arithmetic mean. The compatibility of the model with published nationwide data in Japan was confirmed. (Author abstract)

60416 **APTIC NO. 84603**

Itoh, Shiji, Michio Itoh, Haruhiko Yoshinari, and Ritsu Kikuchi

CONCENTRATION OF OXIDANTS AT NIGHT IN CHIBA PREFECTURE. *(Chibaken ni okeru yakan no okishidanto nodo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):620, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 352.)*

The occurrence of a high (greater than 10 pphm) oxidant level, as measured in Chiba Prefecture during a summer night with a low nitrogen oxides level, was studied. The ozone level was also determined at the time of observation of the high oxidant level; results showed that the ozone level and oxidant level had almost the same values. There was a parallel pattern of change of these two levels over time, which strongly indicated that the ozone was responsible for the occurrence of the high oxidant level. Wind direction was also found to be a responsible factor in the cause of this observed high oxidant level.

60417 **APTIC NO. 80295**

Iverach, David

PLANNING FOR OXIDANT CONTROL IN SYDNEY. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 20-49. 11 refs. (Feb. 17-21.)*

The problem of photochemical air pollution in Sydney, Australia is discussed. Photochemical pollution in the area rose to unacceptably high levels (more than 0.15 ppm oxidants) on more than 80 days each year during 1972 and 1973, with the maximum ozone concentration reaching 0.28 ppm. Emissions of hydrocarbons and nitrogen oxides, both oxidant precursors, amount to an estimated 500 and 150 tons, respectively, each day. Although motor vehicles appear to be the major source of these precursors, industrial sources are significant in several sub-regions. The bulk of the high oxidant potential areas are found in the Parramatta River Valley, and the advection of pollution from these areas to the receptor areas can be explained in terms of the land-breeze, sea-breeze meteorology which characterizes all high oxidant days. Emphasis is being placed on the control of hydrocarbons since control methods for this pollutant are more developed than are those for NOx. Reductions of about 80% in hydrocarbons from base year (1971) levels appear to be required for adequate oxidant control.

60418 **APTIC NO. 83048**

Jenkins, T. F., R. P. Murrmann, and B. E. Brockett

ACCUMULATION OF ATMOSPHERIC POLLUTANTS NEAR FAIRBANKS, ALASKA, DURING WINTER. *Army Corps of Engineers, Hanover, N. H., Cold Regions Research and Engineering Lab., Proj. 4A762720A896, Task 04, Work Unit 004, Rept. 225, 31p., April 1975. 14 refs.*

Continuous air quality measurements were made during January and February of 1973 at a location not under the direct influence of local pollution sources near Fairbanks, Alaska. The measurements were made when atmospheric pollution was expected to be the most severe. The accumulation and dissipation of pollutants appeared to be related to atmospheric inversion conditions, wind speed, and daily traffic patterns. Maximum hourly average concentrations of hydrocarbons, carbon monoxide, carbon dioxide, and condensation nuclei were 9.7 ppm, 22.1 ppm, 482 ppm, and more than 10,000 nuclei/cu cm, respectively, as compared to reported background levels of 1.4 ppm, 0.1 ppm, 320 ppm and 100-400 nuclei/cu cm, respectively. Vehicle emissions appeared to be the primary source of the pollution. (Author abstract modified)

60419 **APTIC NO. 76574**

Kawamura, Kiyoshi and Katsuhiko Fushimi

OBSERVATION RESULTS OF ATMOSPHERIC NOX AND SO2 AT MINAMI-TORISHIMA ISLAND. *(Minami-torishima ni okeru taiki NOx oyobi SO2 no kansoku kekka ni tsuite). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 88, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975, Paper 219.)*

The atmospheric nitrogen oxides and sulfur dioxide levels at an island in the western Pacific Ocean were measured. The NOx were determined both by the National Environmental Policy Act method (1973) and the copper-cadmium reduction cylinder method after the air sample was trapped in a sodium hydroxide-sodium arsenite solution. When the conversion coefficient 0.84 was used in the former method, its analytical results agreed with the results obtained by the latter method. Since the value 0.84 was obtained from data for the Tokyo atmosphere, this suggested that the conversion coefficient was not dependent on the atmospheric NOx level. The SO2 was determined by the modified West-Gaeke method. The nitrogen dioxide and nitric oxide had a parallel concentration relationship regarding the time variation, and the NO level always exceeded the NO2 level. The 10-day average level for NO2 and NO was 1.3 and 1.7 microgram/cu m air, respectively. The 5-day average of the SO2 level was 0.68 microgram/cu m.

60420 **APTIC NO. 82790**

Kleinman, Michael T., David M. Bernstein, Merril Eisenbud, and Theo. J. Kneip

SEASONAL AND SOURCE RELATIONSHIPS FOR URBAN SUSPENDED PARTICULATE MATTER AND TRACE ELEMENT CONCENTRATIONS IN NEW YORK CITY. *Preprint, New York Univ. Medical Center, New York, Inst. of Environmental Medicine, 18p., 1975 (?). 9 refs.*

Airborne samples of total suspended particulates, lead, vanadium, and copper were obtained at four rooftop locations in New York City between 1972 and 1974 in order to investigate relationships between the above pollutants and seasonal and source fluctuations. Comparisons of dispersion normalized data indicate increased emissions of total suspended particulates and vanadium in some areas of the city which were associated with the use of high sulfur fuels burned in late 1973 and early 1974. Peak normalized values of lead occurred during the winter months, indicating that emissions of lead which are primarily associated with automobiles in New York are lower during the summer than in the winter. Both normalized and uncorrected data for vanadium showed definite peaks in the winter months, a finding consistent with the hypothesis that emissions from fuel oil burning are higher in the winter than in the summer. Peak values of total suspended particulates were shifted from the summer months to the winter as a result of normalization, indicating that an important source of particulate emissions during the winter months was obscured by the effects of dispersion variations. This source was assumed to be space heating. Elevated copper concentrations were correlated with winds from the south and east. Peak values were not notably shited by normalization.

60421 **APTIC NO. 83695**

Koide, Keiko, Yuji Tsuruta, Keiji Sugimura, Kazunori Ueno, Masahiro Kawakami, and Osamu Imamura

STUDIES ON AIR POLLUTION. SO2 CONCENTRATION AROUND MOUNT ASO AND VOLCANIC ASH FALL. *(Taiki osen ni kansuru kenkyu, Katsudoki ni okeru* *ashokazan shuhen no SO2 nodo to kobairyo ni tsuite). Text in Japanese. Kumamotoken Eisei Kogai Kenkyusho Ho (Annu. Rep. Kumamoto Prefect. Inst.), vol. 1974:38-42, 1975.*

Air pollution related to Mt. Aso volcano during its active period was studied. The concentration of sulfur dioxide (SO2) and the amount of dust fall was measured in the area neighboring Mt. Aso. Mount Aso increased its activity in July 1974, causing considerable damage to the neighboring agriculture and sericulture. The SO2 concentration was measured by the Lead Dioxide Method and dust fall was measured by the Deposit Gauge Method from September to December of 1974 at six selected measuring points of the A.F.G.H.I.J. The distance from the crater to each point was 0.5, 14.0, 6.5, 10.5, 8.5 and 8.0 km. Sulfur oxides concentrations measured at point A were 1.81 to 3.12 mg/ 100 sq m/day, but all other points showed SOx concentrations the same as those of unpolluted areas. The maximum dust fall at point A was 6400 ton/k sq m/mo; points G,H,I, and J, had 382, 144, 128 and 128 ton/k sq m/mo, respectively. The investigation revealed that Mt. Aso, during an active period, releases a comparatively small amount of gaseous substances, but discharges a large amount of volcanic ash, which is closely related to the environmental pollution of the area neighboring Mt. Aso.

60422 **APTIC NO. 79328**

Kyoda, M., K. Nakano, S. Fukuoka, and T. Ohira

INVESTIGATION RESULTS AND CONSIDERATIONS ON THE ATMOSPHERIC CYANIDE COMPOUND. *(Taikichu shian kagobutsu chosa kekka to kosatsu). Text in Japanese. Tokyo-To Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:14-22, 1975. 1 ref.*

Investigations of the atmospheric cyano compounds were conducted in July, Oct. and Dec. 1973 and in Feb. 1974 at 6 locations in Tokyo. Air was sampled at 2.0 l/min for 120 min using 10 ml of 1 N NaOH solution. The cyano compounds were analyzed by the pyridine-pyrazoline method according to the JIS K0109 method. The average cyanide concentrations ranged from 2.3 ppb at Miyabori to 1.2 ppb at Ishikamii. The highest concentration was 35.1 ppb in Oct. 1973 at Miyabori. High average concentrations generally appeared in the fall. The cyanide concentrations were higher in the areas with more traffic but lower in the industrial areas with less traffic. The cyanide concentration in the air showed trends similar to those of nitric oxide and carbon monoxide.

60423 **APTIC NO. 82773**

Lee, Robert E., Jr. and Stephen Goranson

THE NATIONAL AIR SURVEILLANCE CASCADE IMPACTOR NETWORK III. VARIATIONS IN THE SIZE OF AIRBORNE PARTICULATE MATTER OVER A THREE-YEAR PERIOD. *Preprint, American Inst. of Chemical Engineers, New York, 30p., 1975. 40 refs. (Presented at the American Institute of Chemical Engineers Annual Meeting, 68th, Los Angeles, Calif., Nov. 16-20, 1975.)*

A cascade impactor network operating from 1970 through 1972 at eight urban and two nonurban sites indicated that the median size of airborne particles on a mass basis increased over the sampling period. Although the overall trend in increasing particle size appeared to be related with time, quarterly variations in the median size were associated with seasonal changes; particle sizes decreased in summer and increased in the winter. The overall trend in the size of airborne particles appeared to be associated with the reduction in automotive emissions which in turn can lead to the production of fine secondary aerosols. Other possible factors related to the increase in median particle size included: the effect of stationary control devices in removing coarse particles, the growth of fine particles through coagulation processes, and the increase in the size of hygroscopic particles as a result of humidity.

60424 **APTIC NO. 79686**

Lovelock, J. E.

NATURAL HALOCARBONS IN THE AIR AND IN THE SEA. *Nature (London), 256(5514):193-194, July 17, 1975. 9 refs.*

Measurements of methyl chloride and other halomethanes in the air and coastal waters of southern England between Dec. 1974 and April 1975 are reported. The ambient concentration of methyl chloride and CCl3F (trichlorofluoromethane) at Bowerchalke varies with wind heading, but methyl chloride is most abundant with air from the Atlantic whereas CCl3F is most abundant with air from continental Europe. The mean concentration of methyl chloride is 1.14 times 10 to the -9th power by volume. The industrial production of methyl chloride in 1973 was 0.35 Mt. This was used almost entirely as a chemical intermediate in the production of other compounds and did not reach the atmosphere as such. The atmospheric CH3Cl is almost certainly not a direct industrial emission.

60425 **APTIC NO. 75108**

Ludwig, F. L. and J. H. S. Kealoha

SELECTING SITES FOR CARBON MONOXIDE MONITORING (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., Office of Air and Waste Management Contract 68-02-1471, Rept. EPA-450/3-75-077, 168p., Sept. 1975. 185 refs.*

NTIS: PB 249700/AS

Procedures and criteria for selecting appropriate locations for carbon monoxide monitoring stations are presented. Location selection is reviewed in terms of providing CO measurements which are representative of downtown street canyon areas, urban neighborhoods, major traffic corridors, and interurban regions. Specific recommendations are included for inlet heights, distances from major roadways, and placement relative to urban areas. Information relating to the use of climatological data, land use information, and traffic data is provided in appendices. A bibliography which is classified according to monitoring purposes and scales of representativeness is also included. A computer program that is designed to identify worst-case conditions and the relative contributions of sources at different distances is outlined. (Author abstract modified)

60426 **APTIC NO. 82597**

Lunche, Robert G., Arthur Davidson, Janet E. Dickinson, and Margaret F. Brunelle

AIR QUALITY TRENDS IN LOS ANGELES COUNTY. *Preprint, Southern California Air Pollution Control District, Los Angeles, Calif., 27p., Dec. 1975. 2 refs. (Presented at the Strategies for Air Pollution Control in the South Coast Air Basin Conference, Pasadena, Calif., Dec. 2-3, 1975.)*

Air quality trends are calculated for oxidants, carbon monoxide, nitrogen dioxide, sulfur dioxide, total suspended particulates, and non-methane hydrocarbons in areas of Los Angeles County most severely affected by air pollution. All of Los Angeles County is expected to be in compliance with both the Federal and California air quality standards for oxidants by the mid-1980 s. The Federal 1-hour standard for CO is expected to be met during the late 1970 s or early 1980 s, while the less stringent California 1-hour standard should be attained in the mid-1970 s. The Federal 8-hour CO standard should be met by the early 1970 s, and the California 12-hour standard should be met prior to that date. The Federal NO2 standard is expected to be achieved by the early 1980 s, and the California NO2 standard should be met during the late 1970 s. The Federal 24-hour SO2 standard is presently being met throughout Los Angeles County and should continue to be met if current trends continue. The far more stringent California 24-hour SO2 standard is currently being achieved at about half of the 13 monitoring stations in Los Angeles County, and no year of compliance with this standard can be projected for the entire county. The Federal and California standards for total suspended particulates based on the annual geometric mean should be met during the late 1970 s. The Federal primary 24-hour total suspended particulate standard is currently being met, while the California 24-hour standard should be attained by the mid-1980 s. The Federal guideline for non-methane hydrocarbons should be met by about 1990. Presently, there exists no such California guideline or standard. (Author summary modified)

60427 **APTIC NO. 82581**

Machta, Lester

TRENDS IN ATMOSPHERIC PROPERTIES. *Preprint, National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Labs., 3p., 1975. 8 refs. (Presented at the Environmental Sensing and Assessment Conf., Las Vegas, Nev., Sept. 14-19, 1975.)*

Global trends in atmospheric levels of carbon dioxide, dust, and ozone are reviewed. An increase in atmospheric CO2 at a rate of about 0.7 ppm (by volume)/yr is recorded for the period between 1958 and 1968, and a growth rate of 1.0 ppm/yr is recorded for the period 1968-1973. The increase is presumably due to the combustion of fossil fuels, with the fraction of man-made CO2 remaining airborne being about 55%. Atmospheric dust is also increasing but not quite on the same global scale as CO2 because of the former s shorter atmospheric residence time. Reductions of a few percent in direct solar radiation are recorded in Europe and Asia for the period from World War II until 1970. Total ozone in the northern hemisphere shows a decrease of about 2% since 1970 after having risen by about 6% since the mid-1950 s. The decrease, however, appears to be the result of natural processes rather than ozone destruciton by man-made fluorocarbons and other pollutants.

60428 **APTIC NO. 84064**

Maedler, R.

SULFUR DIOXIDE EMISSION INVENTORY FOR ZURICH. *Schwerfeldioxid-Emissionskataster fuer Zuerich). Text in German. Gesundheitstech., 9(12):278-280, 1975. 6 refs.*

Sulfur dioxide is a common air pollutant and is of interest to the Health Inspector s Office in Zurich, which compiles an inventory for zone planning, energy requirements, and approval of new urban furnace installations and air pollution control stations. The SO2 discharges by regions in terms of tons and ton/cu km are presented for 1972. They are calculated for the incinerators KVA I (41,901 t) and KVA II (126,283 t) with respect to the number of household oil tanks and oil varieties. The SO2 emissions are compared with national figures and those of foreign countries.

60429 **APTIC NO. 76230**

Mainwaring, Sylvia J. and Shri Harsha

A STUDY OF THE DISTRIBUTION OF PARTICULATES WITH HEIGHT. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc. Rotorua, New Zealand, 1975, p. 471-491. 23 refs. (Feb. 17-21.)*

Particle concentration and size distribution measurements were made at heights ranging from 38 ft to 218 ft over streets in the Melbourne central business district. The total dust concentration decreased with height above the city streets up to heights of 218 ft. No diurnal or weekly variations in dust levels were observed. The size distribution of particulates was essentially constant with height at altitudes above street level between 86 and 218 ft. Larger sized particles were observed in greater percentages at a height of 38 ft above streel level and were probably due to direct interference from street activities, particularly traffic. The majority of particles sampled exhibited diameters greater than 1 micron, and the respirable particle loading values for Melbourne were lower than those reported for other cities.

60430 **APTIC NO. 84193**

Makino, Hiroshi, Hideko Nojima, Yoshio Saigi, and Yasuji Nagami

RELATIONSHIP OF RAINFALL COMPONENTS TO AIR POLLUTION, PART 1. *(Usui seibun to taiki osen to no kankei, dai 1-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):275, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 12.)*

Rainfall components were analyzed for sulfate, nitrate, chloride, and ammonium ions, formaldehyde, and acrolein, and the correlation between the components was considered. The correlation of the rainfall pH with sulfate, nitrate, and chloride ions was poor; the respective correlation factors were 0.003, 0.149, and 0.355. This suggests that these ions were mostly present in salt forms rather than acid forms. The correlation between sulfate and nitrate ion concentrations in the rainfall was high, (0.590) suggesting that its pollution sources are the same. The correlation between ammonium and sulfate ion concentrations was high (0.649), which suggested that the sulfate ion existed as ammonium sulfate to a greater extent. The formaldehyde and acrolein concentrations in rainfall were highly correlated at (0.735). The pollution source is the automobile.

60431 **APTIC NO. 83360**

Makino, Kuniyoshi, Yasuhito Sato, Fumio Kano, Seiki Osawa, Masao Fukuda, and Isao Mizoguchi

A STATISTICAL STUDY ON THE REGIONAL CHARACTERISTICS OF COMPONENTS OF DUSTFALL IN TOKYO METROPOLITAN AREA. *(Tokyoto ni okeru koka baijin seibun no chiikisei ni kansuru tokeiteki kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):59, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 1.)*

The Tokyo Metropolitan Hygienic Research Institute conducted a statistical investigation on the regional characteristics of components of dust deposition in metropolitan Tokyo, and the relation of each component to sulfur dioxide, precipitation, and pH. The contour line graphs reveal the regional distribution of dust deposition in the following classifications: distribution of total dust deposition, distribution of insoluble components, distribution of soluble components and distribution of SO2. The contour graphs indicate that Arakawa County has the lowest insoluble component count, the highest SO2 count, and the lowest average pH count. This is because Arakawa county has the most factories emitting noxious gas of all the counties in Tokyo. The seasonal change in air pollution can also be detected. Other findings are: correlation of insoluble components and percentage of land used as streets and roads and number of dust and soot emitting facilities; inverse correlation of soluble components and pH.

60432 **APTIC NO. 76311**

Mammarella, Luigi

AIR POLLUTION BY AEROSOLS WITH REGARD TO MARINE AEROSOLS. *(L inquinamento atmosferico da aerosoli, con particolari riguardo a quelli marini). Text in Italian. Ingegnere (Milan), 50(5):201-206, May 1975. 6 refs.*

The Italian littoral between Ostia and Anzio, was studied during two winters and one spring for marine aerosols. Parameters included altimetric studies of the littoral up to 300 m from the sea, observation of the growth of vegetation, aerosol sampling with an original differential sampler, 24 meteorogogical surveys, 2 tracer samples, and 24 differential samples. Diffused aerosol damage to the littoral flora are most severe for evergreen vegetation, especially for conifers. In addition to the action of hygroscopic particles, numerous combustible heterogeneous substances present in the air predominantly in the form of aerosols also affect the marine environment. Gases and vapors, either free, adsorbed, or condensed on particles, are also found in the air flow.

60433 **APTIC NO. 84620**

Matsubayashi, Kazuyuki, Kiku Nagai, Kunihide Naka, Motohide Murata, and Yoshikazu Takazuka

DISTRIBUTION OF HYDROCARBONS IN PHOTOCHEMICAL SMOG. *(Kokagaku sumogu doki ni okeru tandasuiso no kyodo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 10(4):626, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 359.)*

Hydrocarbons were measured using gas chromatography with flame ionization detector during an episode of photochemical smog in Mie Prefecture. During the 7 days of analysis, smog forecasts were issued 5 times and photochemical warnings were issued twice. Each measurement of a hydrocarbon level was compared to the initial concentration and to the concentration at the time of the peak oxidant level. The level of unsaturated HC decreased at the time of the oxidant peak, while the levels of saturated HC, aromatic HC, and aldehydes increased slightly. Ethylene, acetylene, and acid aldehyde initially increased with an increase of oxidant level. However, ethylene and acetylene began to decrease before reaching the time of the peak oxidant level. The acid aldehyde level increased steadily with an increase of the oxidant level, and then began to decrease as the oxidant level peaked.

60434 **APTIC NO. 83691**

Matsuda, Masahiko, Yoshiaki Fuchi, and Takashi Masuda

REPORTS ON AIR POLLUTION IN NAGASAKI PREFECTURE. *(Nagasakiken ni okeru taiki osen chosa seiseki). Text in Japanese. Nagasaki-ken Eisei Kogai Kenkyusho Ho (Annu. Rep. Nagasaki Inst. Health Environ. Sci.), no. 14:24-31, Dec. 1975.*

The Nagasaki Prefectural Institute of Health and Environment reports the results of a quantitative analysis of dust fall and sulfur oxides in 1974. Eighteen monitoring stations measured dust fall and sulfur oxides, finding a rather steady yearly average pH value of 4.6 to 5.4. The dust fall peaked in July and December (the dust fall measured in Ohmura in July and December was 9.18 and 4.41 t/k sq m/30 days respectively, compared to a monthly average of 3.33). The Lead Dioxide Method was used to measure sulfur dioxide, and a small amount of sulfur oxides was found (a monthly average of less than 0.5 mg sulfite/ day/100 sq cm). The amount of sulfur oxides decreased in June and November (the sulfur oxides measured in June and November in Kitamura was 0.09 and 0.03 mg/day/100 sq cm, respectively, compared to the previous May and October when the sulfite measurement was 0.20 and 0.15 mg/day/100 sq cm, respectively).

60435 **APTIC NO. 82948**

Matsumoto, Hiroshi, Takunori Kato, Shigekatsu Sakai, Tatsunori Oya, and Shuji Tabuchi

ATMOSPHERIC BENZO(A)PYRENE POLLUTION IN SAPPORO. *(Benzo(a)pyrene ni yoru Sapporoshi no taiki osen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):346, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 91.)*

Atmospheric benzo(a)pyrene was measured for 1 year from August 1974 in Sapporo City, Hokkaido. The benzo(a)pyrene was extracted from the collected airborne dust by a vacuum sublimation method. The determination was then done by the fluorescence method following two-layer one dimensional thin layer chromatographic separation. The frequency distribution of benzo(a)pyrene was found to be an approximate logarithmic normal distribution. The atmospheric benzo(a)pyrene level was higher in the heating season than in the non-heating season. The median value of the benzo(a)pyrene level during the heating and non-heating seasons were 7.2 and 3.4 microgram/1000 cu m air, respectively, while the median value for one year was 1.8 microgram/1000 cu m. The correlation between the benzo(a)pyrene concentration and airborne dust was poor; the correlation coefficient for one year was 0.13. The correlation coefficient between the benzo(a)pyrene concentration and the carbonaceous compounds level was 0.60.

60436 **APTIC NO. 84708**

Matsushita, Shukaku, Keiichi Arashidani, Hisao Hayashi, Masanobu Nagata, Masayuki Ichihashi, and Hiroshi Sato

ANALYSIS OF SOME POLLUTANTS INCLUDING BENZO(3-4)PYRENE IN KAWASAKI AIR. *(Benzo(a)pirento ni yoru kawasakishi no taiki osen jyokyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):579, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 310.)*

Benzo(3-4)pyrene in atmospheric dust collected at various locations in Kawasaki City was studied during 1973 and 1974. The process of analysis was done first by subjecting the collected dust to vacuum evaporation, then by two-layer one-dimensional thin- layer chromatography, and finally by the fluorescence detection method. The seasonal variations of benzo(3-4)pyrene showed that the spring-summer period had lower levels, while the fall-winter period had higher levels. The benzo(3-4)pyrene levels in the winter of 1973 were 1.3 to 2.2 times higher (average 1.6) than those in 1974. The ratio between the summer levels and winter levels at the same sampling locations were greater at less polluted areas than at more highly polluted areas. Among the seven locations, the winter, spring, summer, and fall levels at the most polluted areas averaged, 8.05, 4.09, 4.35, and 9.39 microgram/1000 cu m, respectively; while those corresponding seasonal levels at the least polluted areas averaged 5.63, 2.11, 1.34, and 5.56 microgram/1000 cu m, respectively.

60437 **APTIC NO. 82596**

Melvin, Gary L., Dennis A. Lawler, Stephen A. Tamplin, and Jack L. Hudson

THE DETERMINATION OF AMBIENT CARBON MONOXIDE LEVELS ASSOCIATED WITH INDIRECT SOURCES. *Preprint, Illinois Environmental Protection Agency, Springfield, Div. of Air Pollution Control and Virginia Univ., Charlottesville, 22p., 1975. 6 refs.*

Air quality, meteorological, and traffic data were collected by the Illinois Environmental Protection Agency at busy intersections, roadways, and a large regional shopping center to provide a comprehensive data base for the development of methodologies for reviewing the air quality impact of indirect sources. The highest carbon monoxide levels associated with indirect sources were caused by roadway and roadway-intersection vehicular activity. This was in contrast to the CO levels resulting from the randam vehicular activity occurring in indirect source parking lots. Thus, the highway network servicing an indirect source becomes the controlling factor with respect to the traffic-related elements of facility siting and design. Computer modeling results, as reflected in a standard error of estimate equal to about 1 ppm, appeared to be as good as the monitoring results which were accurate to no more than + or - 1 ppm.

60438 **APTIC NO. 82768**

Miller, A. J., John M. Miller, and Ralph M. Rotty

TWO CASE STUDIES CORRELATING THE BASELINE CO2 RECORD AT MAUNA LOA WITH METEOROLOGICAL AND OCEANIC PARAMETERS. *National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Labs., Rept. ERL ARL-49, 9p., Jan. 1975. 5 refs.*

Changes in baseline carbon dioxide concentration at Mauna Loa Observatory were correlated with meteorological and oceanic parameters by using extended monthly mean CO2 values and subjecting the data to low and high frequency filters. No significant correlations between atmospheric flow index and monthly CO2 data or month-to-month (short-term) changes in the CO2 data were detected. However, the variation in CO2 levels on a long-term (year-to-year) basis appeared to show year-to-year trends similar to those of the sea surface temperature but with the opposite sign. The correlation between the change in CO2 and the change in sea surface temperature along the 20 deg North parallel was -0.648 and -0.607, respectively, depending on whether the temperature used was the minimum monthly or the average along the parallel.

60439 **APTIC NO. 76004**

Miller, David F., Warren E. Schwartz, James L. Gemma, and Arthur Levy

HAZE FORMATION: ITS NATURE AND ORIGIN - 1975. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-0792, Coordinating Research Council Contract CAPA 6-68, Program Element 1AA008, ROAP 21AKB-03, Rept. EPA-650/3-75-010, 100p., March 1975. 37 refs.*

NTIS: PB 244616/AS

Studies on the light scattering properties and chemical composition of urban haze are reported. Continuous light- scattering measurements in New York City, Columbus, Ohio, and Dayton, Ohio revealed similar diurnal patterns in which the maxima occur at night, even on days when strong photochemical activity is evident. Secondary maxima occur during the morning rush hours in New York City. The chemical composition of light-scattering aerosols is vastly different from that of larger particles. Aerosols of less than 2 micron in diameter are composed primarily of sulfur compounds and organic compounds. The sequential extraction of organics with methylene chloride and dioxane solvents accounted for 16-44 wt% of the aerosol mass, with the average being about 30%. The extracts were fractionated into water soluble and insoluble fractions, into acid, base, and neutral fractions, and aromatic and aliphatic fractions. The chemistry of the samples was not sufficiently unique to allow for identification of specific sources and/or precursors of the organic phase of these aerosols. (Author abstract modified)

60440 **APTIC NO. 84208**

Mitani, Kazunori, Hironobu Tsuchiya, and Masato Kondo

INFLUENCE OF AIR POLLUTANTS ON THE INDOOR ATMOSPHERE, III. *(Taiki osen busshitsu no shitsunai kankyo ni oyobosu eikyo ni tsuite III). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):373, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 120.)*

Indoor pollution by suspended dust and nitrogen oxides was studied in three buildings with air conditioning systems. The results were compared with outdoor pollution. The suspended dust was collected by a high volume air sampler and its metal composition was analyzed by atomic absorption spectrometry. The nitrogen oxides analysis was done by both the Saltzman method and a diazo salt method. The indoor metals pollution was lower than the outdoor metals pollution except for copper and cadmium, which was attributed to the exhaust from the high volume air sampler. The average percent ratio of the suspended metal concentration between the indoor air and outdoor air was 65, 175, 420, 65, 56, and 63% for lead, cadmium, copper, iron, manganese, and nickel respectively. The amount of suspended dust was higher indoors than outdoors. Changes in the nitrogen dioxide level indoors were similar to those outdoors, but no similarity was observed for nitric oxide. This was attibutable to the fact that the filter used in the air conditioning system was poor in removal of NO2. The average percent ratio of the NO2 level between the indoor air and the outdoor air was 210 and 69% by the diazo salt method and Saltzman method respectively, while the average percent ratio of the NO level between the indoor air and outdoor air was 119 and 63% by the diazo salt method and Saltzman method respectively. The diazo salt method indicated higher values of NO and NO2 than the Saltzman method.

60441 **APTIC NO. 76564**

Miura, K., T. Kakibaya, T. Mizokoshi, and N. Mizoguchi

SUMMARY OF HIGH DENSITY OXIDANT OCCURRENCE IN OITA CITY IN 1974. *(Showa 49-nendo Oita shinai ni okeru konodo okishidanto hasseidoki no gaiyo). Text in Japanese. Oita-ken Kogai Eisei Senta Nenpo (Ann. Rept. Environ. Pollut. Public Health, Oita Prefect.), no. 2:65-81, Aug. 1975. 2 refs.*

Data relating to the occurrence of high oxidant concentrations in Oita City during the summer of 1974 are tabulated. There were 6 alerts: once in May; three in June; two in August. On May 17, a yearly high of 0.17 ppm oxidant was recorded; on June 13, victims of photochemical oxidant appeared at oxidant concentration of 0.15 ppm. In June, oxidant concentrations exceeded 0.1 ppm/hr for 215 hr. In July, because of a long rainy spell, there were only 31 such hours. Wind velocities ranged from 2-4 m/s. Wind directions were mostly from the north and east (from the sea) during spells of high oxidant concentrations, and implied oxidant sources were present in Beppu Bay. Concentration changes of oxidant with time on May 17 and June 13 were plotted and compared to concentration changes of other pollutants (dust, SO2, NO2, NO); no relationships were discerned.

60442 **APTIC NO. 83629**

Morlin, Zoltan, Magdolna Kertesz, Tibor Czicz0 and Agnes M. Kiss

MONITORING LEAD CONCENTRATIONS IN THE AIR AT POINTS OF HIGH TRAFFIC DENSITY IN BUDAPEST. *(Vizsgalatok a levego olomszennyezettsegenek alakulasara Budapest egyes forgalmi csomopontjain). Text in Hungarian. Energia Atomtech. (Budapest), 28(9):412-416, Sept. 1975. 4 refs.*

The lead and dust concentration of the air measured at five points with heavy traffic in Budapest and at two sampling sites in recreational areas in the suburbs during the April-June 1974 period. The samplings were done between 8-10 am, 1-5 pm and 7-9 pm. All sampling sites were beyond the action radius of lead emission sources other than automobiles. The lead concentrations in the air substantially exceeded the hygienic standard of 0.7 micrograms/cu m at all sites except for the control sites with no vehicle traffic. While the lead concentrations in the air tended to follow the traffic density, they were determined mainly by the traffic density of gasoline engine-powered vehicles, and by wind speed, which had a clear diluting effect, especially at unobstructed sites.

60443 **APTIC NO. 76378**

Mroz, Eugene J. and William H. Zoller

COMPOSITION OF ATMOSPHERIC PARTICULATE MATTER FROM THE ERUPTION OF HEIMAEY, ICELAND. *Science, 190(4213):461-464, Oct. 31, 1975. 14 refs.*

The composition of atmospheric particulate matter in remote areas such as the North Atlantic Ocean and the South Pole was investigated. Atmospheric aerosols from these locations are substantially enriched in selenium, antimony, lead, bromine, zinc, and copper. The relatively high volatility of these elements and many of their compounds suggests that a high temperature dispersal process may be responsible for injecting these elements into the atmosphere. The chemical composition of atmospheric particulate matter and rock samples collected on the island of Heimaey after the January 1973 eruption indicates that volcanic activity is a possible source of these elements.

60444 **APTIC NO. 84433**

Murphy, Thomas J.

CONCENTRATIONS OF PHOSPHORUS IN PRECIPITATION IN THE LAKE MICHIGAN BASIN. *Preprint, IAGLR, 11p., 1975. 12 refs. (Presented at the Atmospheric Contributions to the Chemistry of Lake Waters Symposium, 1st, Longford Mills, Ontario, Canada, Sept. 29, 1975.)*

Concentrations of phosphorus were measured in precipitation in the Lake Michigan Basin. An average concentration of total P was calculated by taking the average of the DePaul and the Harrison crib concentrations as representative of the southern fourth of the Lake, the average of the Illinois Beach and Silver Lake State Park concentrations for the middle half of the Lake and the Beaver Island samples for the northern part of the Lake. This yielded an average concentration of 0.024 mg/l of total P in precipitation on Lake Michigan. For an annual precipitation on the Lake of 74 cm/yr this resulted in an input of 1.0 times 10 to the 6th power kg/yr of P.

60445 **APTIC NO. 76569**

Nakaya, Amane

ATMOSPHERIC AEROSOL CHEMICAL COMPONENT OVER THE EAST CHINA SEA. *(Yojyo taikichu erozoru no kagaku seibun). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 148, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975, Paper 306.)*

The chemical composition of aerosol collected over the East China Sea by a high volume air sampler was determined. After ashing and extraction with 0.1 M acetic acid, both hydrophilic and hydrophobic components in the aerosol were analyzed for sodium, potassium, magnesium, calcium, sulfate, and chloride. Using the chloride concentration as an index, the concentration coefficient of each component was obtained as the ratio between the individual component concentrations in the aerosol and in the water. The average coefficient for the hydrophilic components, obtained using a 0.45 millimicron millipore filter, was 0.49, 2.45, 0.09, 4.82, and 8.14 for Na, K, Mg, Ca, and SO4, respectively. The excess aerosol concentration of individual components, as an indication of aerosol sources other than sea water, showed that the K, Ca, and SO4 levels in the aerosol were higher than those expected from the sea water, while both Na and Mg levels in aerosol were similar to levels expected from the sea water.

60446 **APTIC NO. 84600**

Nakazawa, Yuhei, Rinko Satsuma, Kazutoshi Sasaki, and Hideo Uchida

METHANE CONCENTRATION IN THE ATMOSPHERE. *(Taikichu no metannodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):603, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 337.)*

The atmospheric methane in rice fields, mountain regions, and city areas in Nagano Prefecture was determined. The air samples were collected using a tedlar bag and analyzed by gas chromatography. The average day s level at Nagano City was 1.66 ppm with a maximum of 2.1 ppm and a minimum of 1.37 ppm. The hourly levels tended to be lower in daytime than at night. With strong wind, the daytime level ranged from 1.54 to 1.40 ppm with the average 1.50 ppm. The hourly level in daytime ranged from 1.4 to 1.7 ppm, while at night it ranged from 1.4 to 2.0 ppm. The methane level in a watered rice field was 2 ppm at night, however no methane was detected at the dry rice field. In the determination at a mountain region with altitude higher than 1500 m, the average value was 1.55 ppm with a maximum of 1.58 and a minimum of 1.52 ppm.

60447 **APTIC NO. 75325**

Nicholson, William J., Arthur N. Rohl, and Irving Weisman

ASBESTOS CONTAMINATION OF THE AIR IN PUBLIC BUILDINGS (FINAL REPORT). *New York City Univ., New York, Mount Sinai School of Medicine, Office of Air and Waste Management Contract 68-02-1346, Rept. EPA-450/3-76-004, 65p., Oct. 1975. 11 refs.*

NTIS: PB 250980/AS

Electron microscopic analyses of 116 samples of indoor and outdoor air for asbestos contamination were performed, and 19 buildings in five American cities were chosen to represent the various construction uses of asbestos-containing spray materials. Significant contamination was observed in the air supply systems of buildings in which fibrous type, dry spray, asbestos-containing materials were used. Erosion of similar materials applied for decorative or acoustical purposes was also observed. No contamination was observed in buildings in which cementitious spray material was used. Optical microscopic analysis of building air was not effective for revealing asbestos contamination. (Author summary modified)

60448 **APTIC NO. 82357**

Nishijima, Takeo, Kazutoshi Ota, Tadashi Oda, and Kenji Koizumi

SUSPENDED PARTICULATES CONCENTRATION. *(Fuyufunjin no sokutei kekka ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):344, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 89.)*

The sulfate ion and nitrate ion concentrations in airborne dust collected by a high volume air sampler in two locations in Omiya City in Saitama prefecture were analyzed and their relation to atmospheric sulfur oxides, nitrogen oxides, and oxidant levels was considered. The dust concentration observed at 2 locations was 143.6 and 150.0 microgram/cu m air. The sulfate ion concentration in the dust collected was similar; 11.1 and 11.3 microgram/cu m. When these values were divided by the sulfur dioxide level observed at the respective locations, it yielded ratios of 26.2 and 25.8. The nitrate ion concentration was also similar for the two locations: 5.7 and 5.8 microgram/cu m. When these values were divided by the nitrogen oxides level observed at the respective locations, it also yielded similar ratio values: 3.9 and 3.3.

60449 **APTIC NO. 80285**

O Heare, J.

AMBIENT AIR QUALITY MONITORING IN THE LATROBE VALLEY, VICTORIA. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 455-470. 3 refs. (Feb. 17-21.)*

An air monitoring network designed to measure ground level pollution arising from coal-fired power station emissions in Latrobe Valley, Victoria (Australia) is described along with some representative dust fall and sulfation rate measurements. The network employs dust gauges and lead dioxide candles, and their results are supplemented by meteorological measurements. Relative monthly levels of dustfall and sulfation rate during the period 1970-1973, expressed as a percentage of the average figure for both dust and sulfur dioxide, ranged from 92-111 and from 63-171, respectively. Both dust fall and sulfation rates in the Latrobe Valley show downward trends over the period 1963-1973.

60450 **APTIC NO. 79992**

Obamatsu, H., T. Matsuura, K. Miura, A. Nihira, A. Shikano, and T. Goto

MEASURING RESULTS OF SULFUR DIOXIDE CONCENTRATION AT THE SENDAI LOCAL MEASURING STATION OF THE NATIONAL AIR POLLUTION OBSERVATION BUREAU. *(Kokusetsu taiki osen kansokukyoku sendai sokkosho ni okeru nisanka iou nodo sokutei kekka ni tsuite). Text in Japanese. Miyagi-ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 3:10, 1975.*

The result of sulfur dioxide measurements made during April 1973 through March 1974 at the Sendai Measurement Station for Air Pollution is summarized. The measurement method used as a solution conductivity method. The monthly average level was similar throughout the year with the lowest value of 0.019 ppm in January and the highest value of 0.026 ppm in

March. There was only one occasion that exceeded the environmental standards for 1-hour and 1-day average values. The SO2 trend in a single day was different between the winter and summer periods. The winter pattern had two peaks, occurring at 8 to 9 am and at 12 to 1 pm, which coincided with the operational efficiency pattern of a heating boiler located near the measurement station. The summer pattern did not have a clear peak hour, but the SO2 level tended to increase from 7 to 8 am and stayed at around 0.025 ppm during the day time. The correlation of SO2 level with the wind direction was high in summer. Whenever the wind blew from the industrial area, the SO2 level at the measurement station was higher. The correlation factor was 0.83 to 0.90 in June through August. The SO2 level observed in this year was higher during summer and lower during winter compared to the previous year; the former observation is due to the increased number of factories in the industrial area, and the latter to effective regulation of the fuel used for winter heating.

60451 **APTIC NO. 82684**

Oikawa, Kikuo and Yasutoshi Washio

STATISTICAL ANALYSIS OF NASN AEROSOL DATA. *(NASN ryushijo busshitsu deta no tokeiteki kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):436, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 1.)*

A statistical analysis was performed based on data of aerosols obtained by the National Air Pollution Surveillance Network during 1969-1973. The objective of the analysis was to determine the true state of contamination. Contamination patterns are graphed based on aerosol data obtained at the monitoring stations located in Sapporo, Niigata, Tokyo, Kawasaki, Osaka and Matsue. The patterns indicate that the Kawasaki area is most contaminated with a concentration of all the polluting substances greatly exceeding the national average. The contamination in the Sapporo and Matsue areas is maintained within the national average. Manganese contamination in Niigata is the highest of all other areas surveyed whereas all the other pollutants were kept the same or below the national average. Osaka ranks second and Tokyo ranks third in contamination of air by pollutants.

60452 **APTIC NO. 79329**

Platz, K. H.

AIR HYGIENE STUDIES WITHIN THE MONITORING RANGE OF THE HYGIENE INSTITUTE ZWICKAU. THE SEDIMENTATION DUST INVENTORY IN THE CITY PLAUEN. *(Lufthygienische Untersuchungen im Ueberwachungsbereich des Hygiene-Institutes Zwickau. Der Sedimentationsstaub-Kataster der Stadt Plauen). Text in German. Z. ges. Hyg., Grenzgebiete (Berlin), 21(3):209-212, 1975. 5 refs.*

The results of systematic dust fall measurements, carried out at 29 sampling sites in Plauen, East Germany during the April 1972 through March 1973 period, are presented. The dustfall was determined gravimetrically for 30-day samples. The annual mean dustfall was determined to be 20.5 g/sq m 30 days. Compared with the hygienic standard of 15 g/sq m 30 days (arithmetic mean for the investigation period), this limit value was exceeded at 18 sampling stations (72%). The maximum allowable individual peak value (20 g/sq m 30 days) was not exceeded at 3 sampling stations only (12%). The sites with the highest dustfall values are located near power plants which are not equipped with dust separators, or have low-efficiency dust separators only.

60453 **APTIC NO. 76313**

Ramonda, Guido and Franco Gallinari

ATMOSPHERIC SULFUR DIOXIDE MEASUREMENTS IN PIACENZA, ITALY, DURING THE MAY-JULY 1974 PERIOD. *(Indagine sulla concentrazione di anidride solforosa nell atmosfera della cita di Piacenza: maggio-luglio 1974). Text in Italian. Inquinamento, no. 2:24-28, Feb. 1975. 9 refs.*

Air samples for the determination of sulfur dioxide were collected from four locations in Piacenza: one sampler was placed at the center of the city (D), and the other three were placed in a semi-circle at the outskirts; all were 15-20 m above the ground. In all instances measured quantities were significantly below the limits established by the Italian anti-smog law. This result is related to exceptionally favorable meteorological conditions, with good ventilation, low humidity, and the absence of domestic heating. Concentrations were highest in zone D. Only at station A were concentrations virtually negligible; this would suggest that the city is not significantly affected by the smoke coming from the thermal power installation located about 15 km west of the city. At the other two stations, concentrations averaged about 0.020 mg/cu m. Compared to data collected in May 1968, there is no substantial decrease in concentration.

60454 **APTIC NO. 82445**

Rudolf, Werner

AIR POLLUTION: PHOTOCHEMICAL SMOG AT BROWN HAZE. *(Luftverunreinigung: Photochemischer Smog bei braeunlichem Dunst). Text in German. Umwelt (Duesseldorf), 5(4):38-40, Aug. 1975. 17 refs.*

Systematic measurements of carbon monoxide, nitric oxide, nitrogen dioxide, and ozone concentrations were carried out in a busy street at two different levels in Frankfurt am Main and on an 823 m mountain 25 km away in a study of photochemical smog formation in that city. Carbon monoxide was lowest at 5 am, had a morning maximum at 11 am, and an evening peak at 5:30 pm. The NO concentration peaked at 8 am, but otherwise it followed the CO variations. The NO2 concentrations showed a course similar to that of CO between midnight and 12:30 pm, after which it was independent of the CO and NO concentrations with an attenuated evening peak. For ozone, a low study nocturnal background level was followed by a minimum around 7:30 am and an afternoon peak before 5 pm. The concentration variations measured at 20 m above street level were attenuated. The accumulation of nitrogen oxides and hydrocarbons in the morning, intense solar radiation, and low wind speed caused high ozone concentrations over 170 ppb due to photochemical reactions on some typical summer days. Ozone concentrations of up to 75 ppb, measured at the mountain station, show the transportation of photochemical smog from the urban area over great distances and to considerable heights.

60455 **APTIC NO. 82875**

Rudolf, Werner

AIR POLLUTION. PHOTOCHEMICAL SMOG IN BROWNISH HAZE. *(Luftverunreinigung. Photochemischer Smog bei braeunlichem Dunst). Text in German. Umwelt (Duesseldorf), 5(4):38-48, Aug. 1975. 15 refs.*

Photochemical smog is generated by the actionn of the sun and wind on motor vehicle exhaust and refinery emissions and is characterized by high ozone concentrations. It appears not only in areas with intense radiation and high nitric oxide and hydrocarbon emissions, but also in densely populated regions. To study the high oxidant concentrations in Frankfurt a measuring program was initiated in 1972 for the determination of primary emissions specific to motor vehicles (carbon monoxide, NO, lead) and their photochemical products (nitrogen dioxide, O3) at three different stations. The results of daily determinations touch upon the different emission and diffusion conditions.

60456 **APTIC NO. 81743**

Saito, Tasuya

SURVEY OF SULFUR DIOXIDES. *(Iou sankabutsu no chosa). Text in Japanese. Ibaragi-ken Kogaigijutsu Senta*

Nenpo (Annu. Rept. Environ. Pollut. Res. Center Ibaraki Pref.), no. 7:38-43, Oct. 1975.

A 1974 survey of sulfur oxides pollution in Ibaragi Prefecture is summarized. The determination was made throughout the prefecture by the lead dioxide method, and the results were tabulated by areas and towns for comparison. The yearly average in the northern area for sulfur trioxide was the highest; 0.23 mg/SO3/day/100 cu cm PbO2; the othere areas, southwestern, central, and eastern, had similar yearly averages of 0.18 mg. Higher SO3 levels were observed in spring, compared to other periods in the year. This trend was more obvious for those areas having large industries (northern and eastern areas); however, other areas had similar high SO3 levels in winter. The highest yearly average in a town was observed at Kanisaka in the eastern area, which had 0.32 mg. The next highest was at Hitachi in the northern area; 0.30 mg. Most towns averaged 0.1 to 0.2 mg SO3 annually. The SO3 level in 1974 was lower than that in 1973, except at Kamisaka.

60457 **APTIC NO. 84069**

Sato, Yasuhito, Kuniyoshi Makino, Fumio Kano, Masanobu Osawa, Masao Fukuda, Takahiro Tada, Minoru Aoki, Isao Mizoguchi, and Hiroshi Yagyu

CHANGES NOTED IN THE AMOUNT OF FALL DUST AND SULFUR DIOXIDE IN TOKYO AREA. *(Tokyo-to ni okeru koka baijin oyobi aryusan gasu to no dotai ni tsuite). Text in Japanese. Tokyo-toritsu Eisei Kenkyusho Kenkyu Nenpo (Annu. Rept. Tokyo Metrop. Res. Lab. Public Health), 26(1):265-271, 1975. 17 refs.*

The recent trend in sedimented dust and sulfur dioxide concentration in Tokyo was analyzed based on the data obtained at 28 locations during the period of 1970 to 1974. Both sedimented dust quantity and SO2 concentration showed generally decreasing trends, and the sedimented dust quantity was approaching the plateau. The mean sedimented dust quantity in 1974 was 10.0 ton/sq km/mo and mean SO2 was 0.34 mg SO3/day/100 sq cm. The insoluble component in sedimented dust decreased at a higher rate, and therefore the ratio of soluble component was increased. The polluted areas in Tokyo are congested industrial areas and business districts downtown. The SO2 concentration showed no seasonal variation, however, the sedimented dust quantity was higher in the spring and winter. The average pH was 4.1 in 1974 and was slightly higher compared to that of 1970, which was considered to be attributable to the decrease in SO2 concentration.

60458 **APTIC NO. 84607**

Sato, Yasuhito, Kuniyoshi Makino, Fumio Karino, Isao Mizoguchi, and Hiroshi Yagyu

TENDENCY OF SETTLING DUST, SULFUROUS ACID GAS AND PH VALUE IN TOKYO AREA. *(Tokyoto ni okeru kokabaijin oyobi aryusan gasuto no dotai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):578, 1975. (Presented at Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 309.)*

Trends in the amount of settling dust, sulfur dioxide concentrations, and rainfall pH from data monitored in Tokyo during the past 5 years are discussed. The SO2 levels and the amount of settling dust decreased every year. Settling dust in 1974 averaged 10.1 ten/sq km/mo; SO2 averaged 0.34 mg sulfur trioxide/day/100 sq cm. The amount of settling dust was higher in winter and spring; no seasonal variation was observed for SO2. The average rainfall pH in 1974 was 4.1, an increase over the average of 5 years ago.

60459 **APTIC NO. 84212**

Sawa, Taketsugu and Kichinosuke Sakota

ATMOSPHERIC HYDROCARBONS IN SOUTHERN KYOTO AREA. *(Kyoto-fu nanbu chiiki ni okeru taikichu tankasuiso nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):310, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 52.)*

The atmospheric hydrocarbons level in the southern Kyoto area was studied by gas chromatography. The hydrocarbons determined were ethane, ethylene, propane, propylene, iso-butane, n-butane, acethylene, n-butene, iso-butene, iso-pentane, n-pentane, benzene, toluene, and o-xylene. The alkane, alkene, aromatic hydrocarbon, and alkine levels were similar for all of the 6 measuring points; 2 places on roads and 4 places in residential areas. The average % of the alkane, alkene, aromatic hydrocarbon, and alkine concentrations in the total concentration was 41, 23, 24, and 14%, respectively. A high correlation of ethylene, propylene, and acetylene with carbon monoxide level was observed. The correlations between ethylene and propylene, ethylene and acetylene, propylene and acetylene, and iso-butane and n-pentane were high.

60460 **APTIC NO. 83139**

Schnoerch, Jenoe and Istvan Kovacs

RESULTS OF AIR POLLUTION MEASUREMENTS AT THE MAJOR POWER PLANTS OF HUNGARY. *(Az orszagos villamosenergia-halozat fobb pontjain vegzett legszennyezes meresk eredmenyei). Text in Hungarian. Elektrotechnika (Budapest), 68(7):252-260, July 1975. 10 refs.*

Practical observations on flashovers and breakdowns in high-voltage power lines due to air pollution, and results of systematic measurements of gaseous air pollutant concentrations, and of the electrical conductivity of precipitation and fog water in industrial areas of Hungary are presented. Gaseous pollutants, especially when adsorbed in raindrops and fog droplets, increase the conductivity of dust layers deposited on insulators of power lines in a very short time. Flashovers due to the deposition of ammonium nitrate moistened by precipitation or fog, fly ash, soot, dusts of metal oxides and metals, dusts emitted by ore dressing plants, ceramic plants, coal classifiers, and cement works were observed in Hungary on several occasions. While cement dust alone is not hazardous, it can cause flashovers when combined with hydrophilic particulates, such as sand particles. Systematic measurements in industrial areas revealed increased nitrogen oxides, sulfur dioxide, ammonia, and chlorine concentrations, and increased electrical conductivity of settling particulate matter, precipitation and fog water, especially in areas with frequent flashovers on electrical insulators. Thus, a clear relationship was established between the increased conductivity of air pollutants and precipitation and the incidence of breakdowns.

60461 **APTIC NO. 83743**

Seiler Wolfgang and Heinz Zankl

THE TRACE GASES CO AND H2 OVER MUNICH. *(Die Spurengase CO und H2 ueber Muenchen). Text in German. Umschau Wiss. Tech., 75(23):735-736, 1975.*

Atmospheric carbon monoxide and hydrogen distributions were measured from an airplane over Munich at 100-1000 m altitude, and at about 20 km from the center of the city. Usually the maximum CO concentration of about 0.55 ppm was observed at about 400 m altitude on leeward side of city, compared to a CO concentration of 0.22 ppm on windward side. In the case of H2, concentrations of 0.5 and 0.8 ppm were found on windward and lee sides of Munich, respectively. From data on wind velocities and CO and H2 concentration distributions, the daily production of CO and H2 in Munich area is estimated to be 2,000,000 and 70,000 kg, respectively. Sources of CO and H2 are industry, home heating, and automobile engines. It is estimated that on a global basis, man-made production of these two gases is approximately equal to production from natural sources. Evidence of a man-made increase in atmospheric CO is the higher Northern hemisphere CO concentration (0.15 ppm), compared to that in the Southern hemisphere (0.07 ppm).

60462 **APTIC NO. 76264**

Sekiuchi, T., Y. Shoji, H. Obamatsu, T. Kikuchi, and T. Goto

FROM THE RECENT 4 YEAR FLUE INVESTIGATION IN MIYAGI PREFECTURE. *(Miyagi kennai ni okeru saikin 4 nenkan no endo kensa kekka kara). Text in Japanese. Miyagi Ken Kogai Gijutsu Senta Hokoku (Miyagi Prefect. Pollut. Contr. Tech. Center Rep.), no. 3:14-17, 1975.*

Data on flue gas emissions compiled during 1971-1974 in Miyagi were analyzed. Average particulate concentrations in flue gas from heavy oil boilers and other types of boilers were below the environmental standard in most cases. Yearly variations in average particulate concentration (less than 0.2 g/N cu m) in flue gas from heavy oil boilers showed a decreasing trend, and the emission coefficient (less than 3 kg/kl of heavy oil) also showed a decreasing trend. The accuracy of particulate concentration measurement was evaluated based on the data of 100 ton and 90 ton boilers and kilns. The standard deviation and coefficient of variation were 0.0089-0.0148 and 15-30 for boilers and 0.0082-0.0273 and 4-16 for kilns, respectively.

60463 **APTIC NO. 83839**

Seto, Hiroshi, Kazuyuki Akiyama, and Isao Mizoguchi

DETERMINATION OF ATMOSPHERIC FLUOROCARBONS IN TOKYO AREA. *(Tokyo to ni okeru taikichu yuki fussokagobutsu no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):165, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 49.)*

Atmospheric fluorocarbon (trichlorofluormethane, CCl3F) concentrations in the Tokyo area were measured by gas chromatography. Standard samples were prepared by the permeation method and vacuum dilution method (5-26 ppb). Results of the vacuum dilution method were in good agreement with those obtained by gas phase coulometry, and the reproducibility was good. However, in the case of the value method, results fluctuated from 0.4-2.3% of theoretical value at Pr equals 2.2 ng/min/cm and 81% at Pr equals 139 ng/min cm. The CCl3F concentrations (ppb) measured at eight locations in Tokyo during the period of June-Aug. 1975 were in the range of 0.10-0.35 (min.), 0.10-1.40 (max.) and 0.10-0.65 (ave.). Regional differences in concentration were not evident; however, the concentration showed a tendency to be higher in commercial regions.

60464 **APTIC NO. 76578**

Shinagawa, S.

ON AIR POLLUTION (OXIDANT) IN OITA CITY. *(Oita-shi no taiki osen (okishidanto) ni tsuite). Text in Japanese. Fukuoka Kanku Kishodai Gijutsu Tsushin (Fukuoka District Meteorol. Obs., Tech. Times), 21(2):61-63, April 1975.*

Atmospheric oxidant pollution in Oita city in 1974 is summarized. There are 8 monitoring stations in the city; their measurements are considered along with meteorological factors. The peak oxidant level for the monthly average appeared during April to June for most of the stations. There was no day showing more than a 0.1 ppm oxidant level in either January or February; days showing that level increased from March after the wind velocity tended to slow down with the appearance of the migratory anticyclones. June was the peak month for days with oxidant levels of more than 0.1 ppm. Since the temperature in March was below 20 C, there were no days exceeding the 0.13 ppm level. With increasing maximum daily temperatures in April, the oxidant level exceeded 0.13 ppm but was less than 0.15 ppm. During May through August, there were 2 to 3 days in each month showing oxidant levels of more than 0.15 ppm. Although high oxidant levels decreased in September and October, there were several days in these months showing levels more than 0.1 ppm.

60465 **APTIC NO. 84702**

Shinya, M.

NATIONAL PERSPECTIVE ON PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku taiki osen no zenkokuteki na tenbo). Text in Japanese. PPM (Japan), 6(8):47-56, Aug. 1975. 12 refs.*

The number of oxidant measurement apparatuses in Japan increased from 2 in July 1970 to 600 in March 1975. The number of oxidant alerts issued also increased in the same period, reaching 23 prefectures (out of a total of 47) in 1974, registering over 0.15 ppm oxidant in most of the cities. In the prefectures such as Oita and Niigata, where no alert has ever been issued, 0.12 ppm concentration has been measured. In Osaka, the February temperature ranged between 5 C and 17 C, while oxidant varied between 2 pphm and 7 pphm. In May, the temperature range was 18 C to 27 C, while oxidant concentration varied between 4 pphm and 17 pphm. The same tendency was observed in Nagoya. Photochemical smog is apt to occur under conditions of high pressure and wind velocity less than 4 m/sec, with humidity 60-80% and gradually decreasing. The visibility is 2-3 km (in the central area) with 2-3 hr of sunshine before 1400 hr. The temperature of the sea water is 24-25 C in Tokyo Bay. The high concentration area corresponds to a sea breeze front (about 40 km inland) with the wind direction from sea to inland. The maximum hourly concentration in Japan was reached in Tokyo and Okayama: 0.34 ppm in 1970 and 1974 respectively. Urgent warnings, over 0.30 ppm, were issued 5 times in 1972, 4 times in 1973, and 6 times in 1974. In 1974, there were 9 cases whan an alert was given over 9 prefectures. Of these, 7 cases occurred in May and June, indicating an effect of the long rainy season, since there were none in July. However, on these days, high pressure covered Japan, the wind was weak, it was either clear or partly cloudy, and in Tokyo Bay, from 9-10 am, the land breeze changed to a sea breeze. In 1973, 7 cases of oxidant alerts were issued in more than 9 prefectures, under the same meteorological conditions. In 1974, 14,754 complained of malaise from photochemical smog, the lowest number since 1970.

60466 **APTIC NO. 76269**

Solomon, William R.

A VOLUMETRIC ASSESSMENT OF POLLEN LEVELS IN THE AIR OF ANN ARBOR, MICHIGAN. *Mich. Med., 74(32):699-702, Nov. 1975. 19 refs.*

Volumetric data are reported from an assessment of airborne pollen and spore levels. Particles were sampled from a rooftop in Ann Arbor, Michigan and identified microscopically. Twelve varieties of tree pollens and 15 of nonarboreal species were recovered at or exceeding five grains/cu m during each annual cycle. The prevalence of tree pollens and emanations of herbaceous species is presented graphically. Elm, oak, and mulberry pollens were prominent. There is a striking contrast between ragweed pollen levels and those derived from other herbaceous sources. These data differ from true prevalence levels by factors reflecting the adhesive and impaction efficiencies of the collector use. Ratios of 1 hour peak to 24 hour mean levels exceed 4.0 only occasionally for most pollen types; however, for ragweed pollen, values of 10 or more are not rare. Local effects include the annual flowering of several mulberry trees in the immediate vicinity. Black cherry, the hornbeams, the amphiphilous compositae, and members of the Taxaceae and Cupressaceae may also contribute to the severity of pollinosis in Michigan.

60467 **APTIC NO. 82786**

Stasiuk, William N., Jr., Peter E. Coffey, and Raymond F. McDermott

RELATIONSHIPS BETWEEN SUSPENDED SULFATES AND OZONES AT A NON- URBAN SITE. *Preprint, New York State Dept. of Environmental Conservation, Albany, Div. of Air Resources, 14p., 1975 (?). 19 refs.*

Suspended particulate fractions of sulfate, nitrate, and ammonium ion were studied in relation to ozone concentration, meteorological variables, and airmass trajectory at a remote rural site in New York State. High suspended sulfate concentrations coincided with elevated ozone levels and high temperatures. Sulfates peaked during or just after the passage of the centers of anticyclonic weather systems. The long range transport of sulfate aerosols and ozone appeared to be correlated with these anticyclonic systems. Generally, there was sufficient ammonium ion present in the particulate matter for form ammonium sulfate, although instances did exist when the sulfate was in a more acidic form. Sulfate concentrations were as high as 18.5 micrograms/cu m and were greater than 10 micrograms/cu m about 6% of the time. Nitrate concentrations tended to be low when sulfate concentrations were high. (Author abstract modified)

60468 **APTIC NO. 80128**

Struempler, Arthur W.

TRACE ELEMENT COMPOSITION IN ATMOSPHERIC PARTICULATES DURING 1973 AND THE SUMMER OF 1974 AT CHADRON, NEB. *Environ. Sci. Technol., 9(13):1164-1168, Dec. 1975. 15 refs.*

Air was collected continuously on filters in northwestern Nebraska during 1973 and the summer of 1974. The particulate matter was analyzed for silver, aluminum, cadmium, cobalt, copper, manganese, lead, tantalum, and zinc. Noticeable and consistent seasonal differences were evident in aerosol Al, Mn, and Pb. Those metals found in aerosol particulates are largely soil derived if their concentrations are likewise high in the soil. Conversely, aerosol metals are more likely to be associated with anthropogenic sources if their concentrations are low in the soil. Aerosol Pb is largely derived from the combustion of leaded gasoline, but the aerosol sources of Ag and Cd are more difficult to document. The data serve to monitor any changes in air quality as additional coal fired power plants are constructed at upwind locations. (Author abstract modified)

60469 **APTIC NO. 84616**

Sueta, Shintaro, Kenichi Shimohara, and Shigeichiro Aramaki

DETERMINATION OF TRACE AMOUNTS OF AIRBORNE ORGANIC COMPOUNDS IN KITAKYUSHU CITY, 1. ALIPHATIC HYDROCARBONS. *(Kitakyushu-shi ni okeru fuyufunjin chu no biryo yukibusshitsu no kensaku (1). Shibozoku tanka suiso ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):581, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 312.)*

The n-alkanes in airborne dust collected in Kitakyushu were analyzed. The sample was collected using a high volume sampler with a glass fiber filter, and extracted with benzene. Analysis was by gas chromatography-mass spectrometry. Of the n-alkanes analyzed, C27 to C29 hydrocarbons were found in quantities of 4.3 to 5.5 ng/cu m; the amount of C23 to C25 hydrocarbons was small, 0.1 to 1.5 ng/cu m.

60470 **APTIC NO. 82234**

Suga, Y.

SEASONAL VARIATION OF KINDS AND AMOUNTS OF POLLENS IN THE AIR A STUDY ON POLLENOSIS. *(Kuchu-kafun no kisetsuteki hendo, kafun-sho no kenkyu). Text in Japanese. Min-I-Ren Iryo (J. All-Leagues Democr. Med. Inst.), no. 43:24-25, 1975.*

The results of a survey of the types and amount of pollen in the air in Gumma Prefecture from Aug. 1972 to July 1974 are presented. The number of pollen grains/sq cm was large in spring and autumn, small in summer, and almost zero in winter. From Feb. to May pollen of pinus and cryptomeria predominated, with some quercus and alnus; from April to Oct., pollen of oryza and the family compositae were frequently seen, especially from late Aug. to Oct. (miscanthus, humulus, ambrosia and artemisia). The pollen count and the weather conditions are described. The positivity to intracutaneous tests of Ambrosia artemisifolis, Cryptomeria japonica, Typha angustifolia, Pinus sp., and Pactylis glomerata of a group of asthmatic patients was, respectively, 45, 65, 33, 0 and 0%. A case of pollenosis in response to Cryptomeria japonica is described.

60471 **APTIC NO. 79931**

Suzuki, Hideyo and Shizuo Sato

STUDY ON THE HARM OF ACIDIC RAINWATER AND ITS CAUSE (ORGANIC SUBSTANCES IN THE RAIN. II.). *Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):452, 1975. Translated from Japanese, Scientific Translation Service, Santa Barbara, Calif., 3p. (Presented at the National Conference on Air Pollution, 16th, Japan.)*

The products of photochemical reactions in rainwater were studied and the organic compounds contained in the rainwater when the active photochemical reaction was in progress were analyzed. Water samples were distilled at low pressure and analyzed by gas chromatograph and mass spectrometer. Rainwater was collected from July 15, 1974 to August 15, 1975 in Kawasaki City and Yokohama. The major components found were acetone, ethanol, methanol, methyl ethyl ketone, n butyl alcohol, carbon tetrachloride, benzene, toluene, and acetaldehyde. Drain water, specifically, the water drops on the radiator of a building air cooler, were also analyzed. The concentration of organic compounds in the atmosphere may be a cause of acidic rain.

60472 **APTIC NO. 82316**

Takahashi, Takeo and Michiko Karasawa

ON SULFUR DIOXIDE, SUSPENDED PARTICULATE, AND NITROGEN OXIDES BY AUTOMATED MEASURING DEVICES. *(Jido sokuteiki ni yoru nisanka io, fuyufunjin, chisso sankabutsu ni tsuite). Text in Japanese. Ibaraki-ken Kogaigijutsu Senta Nenpo (Annu. Rept. Environ. Pollut. Res. Center Ibaraki Pref.), no. 7:19-32, Oct. 1975.*

Measurements of sulfur dioxide, nitrogen oxides, and suspended particulates obtained from April 1974 to March 1975 in Ibaraki prefecture were compiled and analyzed. The highest yearly SO2 average was 0.025 ppm and the next highest was 0.024 ppm, lower compared to earlier years. Seventeen days had daily averages exceeding 0.04 ppm. The yearly variation since 1971 showed a slightly decreasing trend in the Hitachi area, with no change in the Kashima area. The monthly variation showed an increasing trend from spring to summer with the development of a sea-land breeze, and a decreasing trend from fall to winter in both the Kashima and the Hitachi area. The suspended particulate concentration was higher during the summer and lower in winter around Hitachi; it varied very little in the Kashima area. The highest yearly nitric oxide average was 0.021 ppm, followed by 0.015 ppm, and the highest one hour value was 0.43 ppm, followed by 0.41 ppm. The highest yearly nitrogen dioxide average was 0.025 ppm, followed by 0.020 ppm, and the highest one hour value was 0.14 ppm, followed by 0.12 ppm. The yearly variation of NO concentration showed little or no change; the NO2 concentration was also unchanged. The number of days with daily averages exceeding 0.02 ppm was higher in winter and lower in summer.

60473 **APTIC NO. 84662**

Torhihasi, Yoshikazu, Motonori Tamaoki, Masanori Yoshioka, Saburomaru Tsujimoto, Norio Oki, and Tsuneaki Takada

DISTRIBUTION OF METALS AROUND THE ROAD. *(Endo kinbo ni okeru kinzoku no bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):551, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 285.)*

A study of metals contained in the airborne dust in close proximity to a street was conducted. The metal identified included lead, iron, nickel, manganese, zinc, cadmium, and cobalt. A high volume air sampler was used to collect the air samples; analysis was performed by atomic absorption spectrometry. Samples were taken from four locations established 40 to 50 meters from the edges of the street. A distribution of metals around the street was obtained. The correlation between metals concentration and the concentration of exhaust gases was also considered.

60474 **APTIC NO. 83393**

Tymen, G., J. F. Butor, A. Renoux, and G. Madelaine

SOME CHRACTERISTICS OF AEROSOL OVER THE ATLANTIC OCEAN. (MIDLANTE A CAMPAIGN, APRIL-MAY 1974). *(Queques caracteristiques d l aerosol situe au-dessus d l Atlantique (campagne Midlante A, avril mai 1974)). Text in French. Chemosphere, 4(6):357-360, Dec. 1975. 7 refs.*

Granulometric measurements over the Atlantic and Brest (where maritime factors are frequently influential) showed a complete absence of pollutant particles over the Atlantic (5-40% for Brest) although sodium chloride (17-20%) and ammonium sulfate (70%) were present as well as mixed particles (0.1-2 millimicron) formed by the association of both salts (10%); these percentages for Brest were 1-15%, 40-70%, and 2-5% respectively. Particles larger than 0.3 millimicron were practically non-existent over the Atlantic, while they reached a 30% average over Brest.

60475 **APTIC NO. 80496**

Tyson, Bennett J.

CHLORINATED HYDROCARBONS IN THE ATMOSPHERE -- ANALYSIS AT THE PARTS-PER-TRILLION LEVEL BY GC-MS. *Anal. Letters, 8(11): 807-813, 1975. 11 refs.*

The mass spectral identification of several chlorinated hydrocarbons in the atmosphere is reported, and further evidence is provided for the widespread distribution of trichlorofluoromethane and dichlorodifluoromethane. Samples of air were simultaneously collected at five sites in California and Nevada. The samples were collected cryogenically using liquid nitrogen. A gas chromatograph and mass spectrometer were used for analysis. Although the high concentrations of Freon 11 and 12 in a densely populated area were not surprising, the rapid drop in their concentration to a constant level at relatively short distances from that area and the maintenance of this level at distant sites demonstrated the wide distribution and constant background level of these compounds in the troposphere. Freon 113 had not been previously identified as a contaminant in ambient air. Freon 113 and 1,1,1-trichloroethane were widespread in the atmosphere but apparently at much lower concentrations than either Freon 11 or Freon 12.

60476 **APTIC NO. 73427**

Wakamatsu, Shinji, Yoshio Saiki, Koji Nagami, and Saburo Sugano

STUDIES ON THE BACKGROUND OF AIR POLLUTANTS. *(Taiki osen bushitsu no bakku gurando chosa). Text in Japanese. Kanagawa- ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.) no. 6:38, Feb. 1975*

Atmospheric nitrogen oxide and oxidant levels were measured in the Hakone area. Since Hakone is the cleanest environment in Kanagawa Prefecture, the observed levels can be used as a background level for a clean environment. The NOx level was 8 ppb which was 15 to 20% of the level found in polluted areas, and the observed oxidant level was similar to that in polluted areas; however, the contribution of ozone to the observed oxidant level was different in polluted and clean areas. The ozone contribution in the Hakone area was 70% of the total oxidant level, but that in polluted areas was 40%. The times of daily peak pollutant levels were later than those observed in polluted areas and the difference between the day s maximum and minimum level of pollutants was much smaller than in polluted areas. A 24-hour periodicity of pollutant levels was observed in the Hakone area as well as in polluted areas.

60477 **APTIC NO. 83945**

Widman, Gary L.

ENVIRONMENTAL QUALITY COUNCIL. ENVIRONMENTAL STATEMENTS. AVAILABILITY. *Federal Register, 40(198):47828-47830, Oct. 10, 1975.*

Final and draft environmental impact statements received by the Council on Environmental Quality from Sept. 29 through Oct. 3, 1975 are summarized. The final statement for a residential development in DeKalb County, Ga. is issued. Adverse impacts are increased demand created on utilities, municipal and community services and facilities, increased surface water run-off, traffic congestion, and increased noise and air pollution. A draft impact statement is issued for the acquisition, development, and use of Navy excessed property at Sand Point, King County, Wash. Adverse impacts include increased air pollution from automobiles and construction disruption.

60478 **APTIC NO. 84618**

Yamamoto, Eiichi

AIR POLLUTION OF THE KASHIMA SEABOARD INDUSTRIAL AREA. *(Kashima chiku no taiki osen ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):443, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 185.)*

The effect of sulfur dioxide pollution in Ibaragi Prefecture on the occurrence of photochemical smog in neighboring prefectures was studied. During a 6-month period, SO2 levels greater than 0.1 ppm occurred on 111 days in Ibaragi at the Kashima Industrial Park; there were 60 such days in areas south of the Industrial park, in Chiba Prefecture. Because these were not industrial areas, this pollution was assumed to originate in the Kashima area. Depending upon wind direction, SO2 levels as high as 0.39 were recorded in Chiba Prefecture. Oxidant levels in Chiba Prefecture also reflected pollution originating in Ibaragi Prefecture. Oxidant levels in the Kashima area ranged from 0.06 to 0.09 ppm; depending upon the wind direction, oxidant levels in the Chiba area were as high as 0.10 ppm.

60479 **APTIC NO. 84386**

Yukovich, Fred M.

A DESCRIPTION OF A TECHNIQUE FOR DEVELOPING AN OPTIMUM AIR POLLUTION AND METEOROLOGICAL SAMPLING NETWORK IN URBAN REGIONS. *Preprint, Research Triangle Inst., Research Triangle Park, N. C., 4p., 1975. 2 refs. (Presented at the Environmental Sensing and Assessment, International Conference, Les Vegas, Nev., Sept. 14-19, 1975.)*

A technique for developing an optimum air pollution and meteorological sampling network in urban regions is described along with its application to the St. Louis Regional Air Pollution Study area. A four dimensional primitive equation model is developed to simulate the flow in urban regions and includes factors that significantly change the synoptic scale flow. The optimum sampling network for the wind field is obtained from a regression model and wind data. An objective variational analysis model is used to obtain the air pollution distribution. Model input parameters consist of the wind field derived from the optimum sampling network, the observed pollution concentrations from the optimum sampling network, and the source emissions. The minimum number of monitoring stations required for acceptable correlation between observed and predicted results is 14. A station plot for the optimum sampling network set up in the St. Louis area is provided.

60480 **APTIC NO. 80366**

Zafonte, L., N. E. Hester, E. R. Stephens, and O. C. Taylor

BACKGROUND AND VERTICAL ATMOSPHERIC MEASUREMENTS OF FLUOROCARBON-11 AND FLUOROCARBON-12 OVER SOUTHERN CALIFORNIA. *Atmos. Environ., 9(11):1007-1009, 1975. 8 refs.*

Sample tubes containing air analyzed for fluorocarbon 11 and fluorocarbon 12 were collected in an aircraft. The samples were collected at altitudes ranging from ground level to 22,000 ft over the Southern California area. Background levels of fluorocarbon 11 and fluorocarbon 12 were determined to be 0.060 and 0.090 ppb, respectively. Simultaneous ozone measurements suggest that these fluorocarbons can be used to trace polluted air below the inversion layer. (Author abstract)

60481 **APTIC NO. 76074**

Office of Air and Waste Management, Research Triangle Park, N. C., Monitoring and Data Analysis Div.

DIRECTORY OF AIR QUALITY MONITORING SITES ACTIVE IN 1973 (ANNUAL REPORT). *Rept. EPA-450/2-75-006, 672p., March 1975.*

NTIS: PB 246659/AS

A listing of all monitoring sites active in 1973 which have submitted a Storage and Retrieval of Aerometric Data Site Identification Form is presented. Each site listed in the directory sampled at least one pollutant during 1973. The structure of the directory is based on the SAROAD site code which indicates the state, city (county, parish, or air pollution control district), the unique sampling site within each city, the agency type, and the project classification. After each individual site description, the pollutant sampling information is presented in terms of pollutant type, method of collection and analysis, sampling interval, units of measurements, and number of observations in 1973.

60482 **APTIC NO. 76568**

AIR QUALITY. *(Taikibu). Text in Japanese. Oita-ken Kogai Eisei Senta Nenpo (Ann. Rept. Environ. Pollut. Public Health, Oita Prefect.), no. 2:61-64, Aug. 1975.*

Work done by the Oita Prefecture Department of Air Quality during 1974 is briefly tabulated. The department undertakes air quality analyses, and monitors air pollutants continuously by means of telemetry. At 10 monitoring locations, sulfur dioxide, airborne dust, NO-NO2, and oxidant, were measured by telemetry. Two locations exceeded a daily average sulfur dioxide concentration of 0.04 ppm, 9.63% and 15.87% of the time. Other locations exceeded 0.04 ppm SO2, 0.00-1.90% of the time. Maximum values for airborne dust ranged from 0.219-0.909 mg/cu m; average values ranged from 0.016-0.043 mg/cu m. Nitrogen dioxide occurred most where there was heavy traffic. Yearly average values of NO2 ranged from 0.012-0.023 ppm; maximum values ranged from 0.067-0.143 ppm. Yearly average values for NO ranged from 0.003-0.010 ppm; maximum values ranged from 0.050-0.177 ppm. Yearly average oxidant concentrations ranged from 0.012 ppm at one location, to 0.03 ppm at all other locations. Maximum hourly oxidant concentrations ranged from 0.124-0.172. The proportion of time when oxidant concentrations exceeded 0.06 ppm, ranged from 4.58-13.72%. At the request of the Japan Environmental Agency, various environmental pollutants, tabulated in this article, were monitored in two additional surveys.

60483 **APTIC NO. 81920**

National Lead Co. of Ohio, Cincinnati, Health and Safety Div.

FEED MATERIALS PRODUCTION CENTER. ENVIRONMENTAL MONITORING ANNUAL REPORT FOR 1974. *In: Environmental Monitoring at Major U. S. Energy Research and Development Administration Contractor Sites. Vol. 2, Energy Research and Development Administration, Washington, D. C., p. 911-942, 1975. 3 refs.*

NTIS: ERDA-54

Environmental monitoring data collected at the Feed Materials Production Center during 1974 is presented. The Center s primary work involves the production of purified uranium metal and compounds for use at Energy Research and Development Administration sites. Ambient air concentrations of particulate matter, nitrogen dioxide, sulfur dioxide, total oxidants, and aldehydes were well within the Ohio Environmental Protection Agency limits during 1974. The amount of airborne uranium released through plant stacks during 1974 was 0.09 curies, and the average airborne uranium level in the vicinity was 0.6% of the standard for insoluble uranium.

60484 **APTIC NO. 82106**

Ibaragi Prefectural Government

ENVIRONMENTAL WHITE PAPER 1974. *(Showa 49 nendo kankyo hakusho). Text in Japanese. 276p., March 1975.*

The 1974 environmental situation in Ibaragi Prefecture is summarized, including air pollution. Major air pollution monitoring stations numbered 5 in the Hitachi Area and 12 in the Kashima Area, and there were 12 additional major stations in the prefecture. They were connected through a telemetry system. The data monitored in 1974 for sulfur oxides, settling dust, airborne dust, nitrogen oxides, oxidant, and photochemical smog are given. The pollution control measures taken are also described.

60485 **APTIC NO. 82108**

Kyoto Municipal Office

DATA FOR ENVIRONMENTAL POLLUTION INVESTIGATION. *(Kogai chosa shiryo). Text in Japanese. 59p., 1975.*

The 1974 environmental pollution in Kyoto city is summarized based on measurements made at 15 monitoring stations throughout the city of the atmospheric sulfur dioxide, airborne particulates, nitrogen dioxide, oxidant, carbon monoxide, and settling dust. The yearly trends from the previous year s measurements are included.

60486 **APTIC NO. 82109**

Marugame Municipal Office, Pollution and Traffic Div.

PRESENT STATUS OF ENVIRONMENTAL POLLUTION AND ITS COUNTERMEASURE. *(Kogai no genjo to taisaku). Text in Japanese. 178p., Aug. 1975.*

The operation of the Marugame city (Kagawa Prefecture) environmental control administration is summarized. Measurements of atmospheric sulfur oxides, settling dust, airborne particulates, nitrogen oxides, and oxidant levels from April 1974 through March 1975 are given.

60487 **APTIC NO. 82110**

Takamatsu Municipal Office, Div. of Citizens

ENVIRONMENTAL POLLUTION AT TAKAMATSU CITY. *(Takamatsu-shi no kogai). Text in Japanese. 130p., 1975.*

The environmental pollution in Takamatsu City, Kagawa Prefecture, is summarized from April 1974 through March 1975, including measurements of atmospheric sulfur oxides, nitrogen oxides, carbon monoxide, oxidant, and airborne dust levels.

60488 **APTIC NO. 82211**

Shimane Prefectural Government

MEASURING REPORTS IN 1972 BY GOVERNMENT-ESTABLISHED MATSUE METEOROLOGICAL BUREAU. *(Kokusetsu taiki sokuteimo Matsue sokuteikyoku, Showa 47 nendo sokutei kekka hokokusho). Text in Japanese. 111p., 1975.*

The results of measurements obtained at the Matsue meteorological station of the National Air Pollution Analytic Network during the fiscal year 1972 are given. Yearly and monthly tables of measurements are provided, including the main air pollutants (sulfur oxides, airborne dust, nitrogen oxides) and meteorological factors (wind direction and velocity, temperature, humidity). The yearly average SOx measurement was 0.017 ppm/hr and there was no SOx warning issued during the year. The average yearly measurements of dust, nitrogen dioxide, and nitric oxide are 0.01 mg/cu m/hr, 0.007 ppm/hr, and 0.007 ppm/hr, respectively. The correlation of the wind direction with SOx contamination indicates that the highest SOx concentration within the yearly average of 0.021 ppm/hr was detected with a wind from the south, and the lowest (0.016 ppm/hr) with winds from the north, south-west, west, or west-north-west.

60489 **APTIC NO. 82398**

Ota Ward Office, Environmental Div.

REPORTS OF AIR POLLUTION BY OVERALL MONITORING OFFICE. *(Taiki osen sogo sokuteishitsu sokutei kekka hokokusho). Text in Japanese. 65p., March 1975.*

Daily measurements of air pollution in 1973 in Ota Ward, Tokyo, are given for sulfur oxides, oxidant, carbon monoxide, total hydrocarbons, and airborne dust, for each of 5 monitoring stations in the ward.

60490 **APTIC NO. 82879**

Ota Ward Office, Tokyo (Japan), Environmental Pollution Div.

REPORTS ON AIR POLLUTION MEASUREMENT BY THE COLLECTIVE MEASUREMENT OFFICE. *(Taiki osen sogo sokuteishitsu sokutei kekka hokokusho). Text in Japanese. 107p., 1975.*

Air pollution was monitored at five locations on Ota ward. The data obtained during the period of Jan. 1974 to March 1975 are given. Sulfur oxides, oxidants, nitric oxide, nitrogen dioxide, carbon monoxide, hydrocarbons, ultraviolet intensity, suspended particulates, wind direction, wind velocity, temperature, and humidity are given. Data on each item are classified into daily average and hourly average, and given in tabular forms. The variation of daily averages during a one year period, and the diurnal variation of hourly averages are shown. The monthly wind rose at each measuring location is also given.

60491 **APTIC NO. 82903**

Shimane Prefecture Public Health Lab.

MEASUREMENT DATA REPORT FOR 1974 BY GOVERNMENT-ESTABLISHED MATSUE METEOROLOGICAL STATION. *(Kokusetsu taiki sokuteimo Matsue sokuteisho, Showa 49 nendo sokutei kekka hokokusho). Text in Japanese. 59p., 1975.*

Measurements of sulfur dioxide, suspended particulates, nitrogen oxides, oxidant, settling dust, wind direction, wind velocity, temperature, and humidity (component analysis of suspended particulates and sedimented dust) obtained in Matsue city during 1974 are compiled and classified. Descriptions of measurement location and measurement instrument are given. Pollutant data were classified to investigate the yearly, monthly, diurnal variation; data are given in tabular form. Average monthly concentrations were 0.020 ppm for SO2, 0.01 mg/cu m for dust, 0.005 ppm for nitric oxide, 0.008 ppm for nitrogen dioxide, 0.015 ppm for NO + NO2 and 0.028 ppm for oxidants. Average monthly wind velocity was 2.5 m/s, temperature 14.7 C, and humidity 74.2%.

60492 **APTIC NO. 82962**

Saitama Prefecture Environmental Pollution Research Center

SURVEY OF AUTOMOBILE EMISSIONS. *(Jidosha haishutsu gasu chosa). Text in Japanese. Saitama-ken Kogai Senta Nenpo (Annu. Rept. Saitama Pref. Environ. Pollut. Res. Cent.), no. 2:51-56, 1975.*

In 1973 the Saitama Prefectural Environmental Pollution Research Center conducted a survey on auto exhausts at 54 points located at 20 main intersections in Saitama. Carbon monoxide, nitrogen oxides, lead, and traffic volume were measured. Non-dispersive infrared analysis, the Jacobs method, the atomic absorption method and a traffic pattern recorder were used, respectively. The results of the survey are tabulated. The highest of the 8-hour averages of carbon monoxide was 21.8 ppm/hr, which was measured in front of the Wako station in Wako city; the lowest was 1.0 ppm/hr measured in front of the Fuji Bank in Renjaku-machi.

60493 **APTIC NO. 83221**

Hiroshima Prefectural Inst. of Public Health and Environmental Science (Japan), Dept. of Atmosphere and Noise

POLLUTION IN HIROSHIMA. *Text in Japanese. In: Annual Report of the Lab. of Public Health and Instt. of Environmental Science, Hiroshima Prefecture, p. 143-157, 1975.*

The concentration of suspended particulate matter in the Hiroshima and Kure area was studied using a high-volume air sampler. The components of suspended particulates such as tar, chlorine ion, sulfuric acid ion, nitric acid ion, and iron were analyzed. All but one monitoring station in Kure found a lower concentration of suspended particulates in the Kure area than at the stations in Hiroshima. The metal contents, including cadmium, lead, copper, zinc and manganese, of the suspended particulates were analyzed using atomic absorption spectrophotometry in the industrial areas. The Takehara area had the highest average concentration of cadmium, lead and copper while the Kure area had the highest average concentration of zinc, manganese and iron. The alkaline filter paper method was studied as a supplement to the automatic Saltzman analyzer, the heavy metals contained in the dustfall in the area of non-ferrous metal refineries were measured, effects of automotive speed and traffic on the noise level were studied, and the accuracy of the sulfur dioxide automatic analyzer, was determined.

60494 **APTIC NO. 83397**

Itami Municipal Office

AIR POLLUTION. *(Taiki Osen). Text in Japanese. In: Summary of Environmental Pollution in Itami City, p. 13-60, Nov. 1975.*

Air pollution environmental standards, the air pollution measuring network, air pollution control and present conditions of air pollution in Itami are discussed. Sulfur oxides measurements at three monitoring stations in Itami show that the concentration of sulfur oxide has reached or almost reached the environmental daily average standard of 0.040 ppm/hr. The average yearly dustfall at the 6 measuring points is 4.69 t/sq km/month in 1974, and has declined for two years. The measurement of photochemical oxidant pollution in the city at three points indicates that the concentration of photochemical oxidants reached the environmental standard of a daily average below 0.060 ppm/hr 91% of the year. However, the measured concentration of nitrogen dioxide indicates a poor conformation to the environmental standard of a daily average of 0.020 ppm/hr. Auto exhaust emission gas measurements indicate a poor conformation of nitrogen oxides and satisfactory conformation of carbon monoxide to the environmental standards.

60495 **APTIC NO. 83398**

Nishinomiya Municipal Office

POLLUTION CAUSED BY AUTOMOBILE EMISSION GAS. *(Jidosha haishutsu gasu osen). Text in Japanese. In: Environment at Nishinomiya (1975), p. 97-105, 1975.*

The results of quantitative analysis of auto exhaust emission gas measured at three monitoring stations in Nishinomiya are given. Concentrations of nitrogen oxides (NOx) were measured at 4 different points along a main artery. Nitrogen oxides pollution increased at a greater rate in 1974 than in 1973, and nitrogen monoxide increased in winter more than in the other seasons, and was much more prevalent in areas along roads than in the atmosphere. The source of carbon monoxide was primarily auto exhaust gas. Concentrations of carbon monoxide have bbeen measured since 1970, and are reported to have steadily declined during the last three years. The concentration of carbon monoxide is greatly influenced by the morning and evening auto rush hours; it was, however, below the environmental standard at all three monitoring stations. Emission of hydrocarbons was related to the formation of oxidants, which are the cause of photochemical smog; however, the environmental standard for hydrocarbons is still under investigation by the National Council for Control of Environmental Pollution. Concentrations of hydrocarbons and unsaturated hydrocarbons were measured in 1974.

60496 **APTIC NO. 83399**

Fukuoka Prefectural Environmental Pollution Center

INVESTIGATIONS OF AIR POLLUTION. *(Taiki Osen Kankei). Text in Japanese. In: Annual Report of Fukuoka Environmental Research Center (1973), p. 30-34, 1975.*

The following studies were made in 1973: the effect of combined pollutants on humans; gaseous air pollution in Fukuoka; the distribution of air pollutants; air pollution of underground arcades; air pollution in Karita, Ikuhashi, and Mizumaki; dust pollution in the Tagawa area and in Omuta city; the effects of fluorine in the Omuta and Orano area; and damage to vegetation by fluorine. Fukuoka Prefecture had higher concentrations of sulfur oxides, nitric oxide, nitrogen dioxide, and dust compared to the national average, but lower cadmium, manganese, lead, and iron. The investigation of dust pollution in the Tagawa area was conducted to prove that the source of environmental pollution in this area is a cement plant. The investigation found large amounts of heavy metals such as cadmium, copper, zinc, and manganese in airborne dust and dust deposits in the Tagawa area.

60497 **APTIC NO. 83483**

Saitama Prefectural Environmental Pollution Research Center

THE AIR POLLUTION SITUATION IN SAITAMA PREFECTURE IN 1973. *(Saitamaken ni okeru taiki osen jokyo no kekka ni tsuite. Showa 48 nendo). Text in Japanese. Saitama-ken Kogai Senta Nenpo (Annu. Rept. Saitama Pref. Environ. Pollut. Res. Cent.), no. 2:92-107, 1975.*

The results of air pollution surveillance conducted in 1973 for control of an air pollution emergency and for comparison of Saitama air pollution concentrations to the environmental standards are presented. The surveillance was based on the Air Pollution Control Law, and the Saitama Prefectural Environmental Pollution Prevention acts. There are 26 environmental monitoring stations, twenty of them equipped with telemeters. The environmental standards in 1973 for carbon monoxide, suspended particulate matter, nitrogen dioxide, photochemical oxidants, and sulfur dioxide are compared with actual concentrations monitored in Saitama Prefecture. Nitrogen dioxide in Saitama prefecture showed a very high concentration at all monitoring stations; the lowest monitored daily average was 0.028 ppm/hr, compared to the environmental standard (daily average below 0.02 ppm/hr).

60498 **APTIC NO. 83501**

Ohta Ward Office, Construction and Environmental Pollution Div.

ENVIRONMENTAL POLLUTION CONTROL. *(Kogai taisaku). Text in Japanese. In: Summary of Environmental Pollution In Ohta Ward, p. 21-33, 1975.*

Air Pollution Control in the Ohta ward of Tokyo is discussed, and the following subjects are discussed: an air pollution observation system using telemeters; an investigation of environmental dust using low-volume air samplers with a cyclone silhouetter and an Anderson sampler; a limited-air investigation of sulfur dioxide using the lead dioxide method; an investigation of the effect of pollution on vegetation; and the Ohta ward photochemical smog warning system. The concentrations of sulfur oxides, nitrogen oxides, and carbon monoxide in this ward are generally declining; however, the concentration of nitrogen dioxide is still greatly above the daily average environmental standard of 0.02 ppm/hr. Limited area sulfur dioxide concentrations are largely influenced by the density of small industries and highways with heavy auto traffic. Photochemical smog warnings were announced 20 times in 1974 and a total of 32 victims were reported, which is a great improvement over 1973.

60499 **APTIC NO. 83510**

Arakawa Ward Office, Construction and Public Nuisance Div.

ENVIRONMENTAL POLLUTAION AT ARAKAWA WARD. A SUPPLEMENT. *(Arakawa-ku no kogai). Text in Japanese. 45p., July 1975.*

A report on environmental pollution at Arakawa Ward for Jan.-March 1975 is given. Data on building permit applications and registration in compliance with the Tokyo Pollution Control Ordinance, registration in compliance with the noise control ordinance, pollution related complaints, measurement of automotive exhaust emissions at intersections, noise pollution by automobiles, concentrations of nitric oxide, nitrogen dioxide, and sulfur dioxide, wind velocity, wind direction, and heavy metal components in suspended particulates are given. The 1974 budget allocation for the pollution control projects is also given.

60500 **APTIC NO. 83844**

Osaka Municipal Office (Japan)

PRESENT STATUS OF AIR POLLUTION AND ITS COUNTERMEASURE. *(Taiki osen no genjyo to taisaku). Text in Japanese. In: Present Status of Pollution and Its Countermeasure), p. 3-75, Sept. 1975.*

The present status of air pollution in Osaka was investigated by compiling pollution data on the sedimented dust, sulfur oxides, suspended particulates, carbon monoxide, nitrogen dioxide, oxidant, wind direction, wind velocity, and number of photochemical smog days obtained during the 1974 fiscal year, the yearly variations of each pollutant concentration, and the regional distribution of each pollutant concentration with descriptions of measuring points, sampling methods and measurement methods. Comparison data of carbon monoxide, nitrogen dioxide, and oxidant concentrations with environmental standards are included. Descriptions of air pollution and pollutant source monitoring systems, location of monitoring stations, air pollution control measures, photochemical smog control measures, photochemical smog emergency procedures and automotive exhaust emission control measures are also given.

60501 **APTIC NO. 84216**

RESULT AND OBSERVATION OF AIR POLLUTION AFTER SPOT CHECKING IN COASTAL AREA OF KANAGAWA PREFECTURE. *(Kyokuchi chosa no kekka to kosatsu). Text in Japanese. In: Report of Kanagawa Prefecture Coastal Area Air Pollution Survey Association, p. 123-186, Dec. 1974.*

Since photochemical smog is caused by secondary pollutants, generated anew when nitrogen oxides and hydrocarbon, in emission gas from factories and automobiles are exposed to ultraviolet light, it must be under strong influence of local pollutants. From July 10-12, 1973, the area round Isogo Technological High School was surveyed for hydrocarbon (11 locations) and carbon monoxide (310 locations) by gas chromatography. From July 3-5, 1973, the area round Tomei Highway in Kawasaki City was surveyed for nitrogen oxides (41 locations), hydrocarbon (13 locations), and carbon monoxide (223 locations), and again from Jan. 29-31, 1974, for nitrogen oxides, 9 locations; for hydrocarbon 2 spots, for carbon monoxide 6 spots, 1 spot for sulfur oxides, 1 for aerosol, 1 for wind direction velocity, temperature, and humidity, 1 pilot balloon observation of wind direction and velocity of upper strata, and 1 spot for traffic volume. In summer, both at the area around the highway and high school, the concentration in the afternoon was lower than in the morning, because the survey in the morning was made right after rush hour, while the survey in the afternoon preceded the evening rush hour, and also because the strong sunshine caused the air close to the ground to rise. In winter, CO concentration decreased from 2300 hr to 0600 the next day, when traffic volume decreased. At 2000 hr, Jan 30, when carbon monoxide reached the highest value, the wind was weakest. Carbon monoxide concentration in winter at one spot has a correlation with nitrogen oxides (chemiluminescence method) of 0.75.

60502 **APTIC NO. 84621**

Kitakyushu Municipal Office, Bureau of Environmental Pollution Control (Japan)

PRESENT STATUS OF POLLUTION AND ITS COUNTERMEASURE. *(Kogai no genkyo to taisaku). Text in Japanese. Kitakyushu-shi no kogai 50-nendo (Environ. Pollut. Kitakyushu City, 1975), no. 9:16-129, 1975.*

Results of an air pollution survey taken in 1974 for Kitakyushu City are summarized for sulfur dioxide, sediment dust, airborne dust, nitrogen oxides, carbon monoxide, and photochemical oxidants. There were six different monitoring locations for the photochemical oxidants and the annual average of the photochemical oxidants ranged between 0.019 ppm and 0.033 ppm. The 1-hour average ranged from 0.09 to 0.15 ppm. There were only two days on which were recorded an average one hour value as greater than 0.15. Both occurred at a monitoring station located in a semi- industrial area. No monitoring stations from the residential area reported days with such high photochemical oxidant levels.

1974

60503 **APTIC NO. 79807**

Allee, Paul A.

ATMOSPHERIC PARTICULATE CONCENTRATION MEASURED DURING THE 1969 BOMEX EXPERIMENT. *In: Atmospheric Physics and Chemistry Laboratory Collected Reprints 1973. National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Lab., p 7-13, Nov. 1974. 5 refs. (Presented at the International Conference on Nucleation, 8th, Leningrad, USSR, Sept. 23-29, 1973; also presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

GPO

Particulate matter above the Atlantic Ocean was sampled from an aircraft and a ship. Three types of atmospheric particulate concentrations were measured on most of the 18 flights: total particulates, cloud droplet condensation nuclei (CCN), and ice nuclei. Only the total Aitken nuclei concentration was measured on the ship. The aerosol plume downwind from and generated by Barbados was investigated. The aircraft was equipped with an isokinetic sampling intake. Total Aitken nuclei concentrations were measured with a Gardner Small Particle Detector. Cloud droplet condensation nuclei concentrations were measured with a thermal diffusion chamber. Ice nuclei concentrations were measured with an acoustic ice nucleus counter at -20 C. The results are summarized. Although the maritime atmosphere appeared hazy, the concentration of total Aitken particles was usually less than 400 per ml. The variation of Aitken nuclei concentration with altitude is shown. There is a strong correlation between total particulates and CCN, except at 2000 ft. There is no apparent correlation between total particulates and ice nuclei. The atmosphere above this area of the Atlantic Ocean is free of industrial particulate pollution. It is recommended that areas such as this be monitored at appropriate intervals to measure any increase of the atmospheric particle concentration.

60504 **APTIC NO. 73154**

Bevan, M. G., D. M. Colwill, and L. E. Hogbin

MEASUREMENTS OF PARTICULATE LEAD ON THE M4 MOTORWAY AT HARLINGTON. *Dept. of the Environment, Crowthorne (England), Transport and Road Research Lab., Rept. 626, 29p., 1974. 11 refs.*

NTIS: PB 235409

Airborne particulate lead concentrations were measured along a heavily travelled highway, serving approximately 70,000 gasoline engine vehicles per day; lead concentrations were also recorded for soil samples along the roadway and for the atmosphere inside a test vehicle. An average airborne lead concentration of 20.6 micrograms/cu m was recorded for the period 0700-1900 hr at the center of the roadway during the autumn of 1972, with the average weekday 24-hour value being 15.1 micrograms/cu m. The lead concentration inside the vehicle was 76% of that recorded at the center of the roadway. Airborne particulate lead levels at a distance of 30 m from the center of the roadway decreased to between 4.5 and 11.9 micrograms/cu m, and at 120 m distance the lead values fell to between 1.4 and 1.9 micrograms/cu m. Soil concentrations of lead decreased exponentially with distance from the edge of the road, falling from a maximum of 3085 micrograms/g dry soil at the edge to a low of 74 micrograms/g at 15.25 m distance from the road.

60505 **APTIC NO. 79589**

Chester, R., S. R. Aston, J. H. Stoner, and D. Bruty

TRACE METALS IN SOIL-SIZED PARTICLES FROM THE LOWER TROPOSPHERE OVER THE WORLD OCEAN. *J. Rech. Atmospheriques, 8(3):777-789, July-Dec. 1974. 18 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

The concentrations of manganese, nickel, cobalt, copper, chromium, vanadium, tin, lead, and zinc are given for soil sized atmospheric particles collected by a shipboard mesh technique from the major wind systems of the North Atlantic, South Atlantic, and Indian Oceans, the China Sea, and various coastal localities. On a world wide average, the elements Mn, Ni, Co, gallium, Cr, V, barium, and strontium have concentrations in the soil sized particles which are of the same order of magnitude as those of average crustal material. The average concentrations of Pb, Sn, and Zn are one order of magnitude higher than those of average crustal material. Within this world wide average there are significant geographical variations in the distributions of Pb, Sn, and Zn which may be related to anthropogenic sources. A tentative model is summarized which is based on the mixing of three principal genetic components of soil size particles; zonal, inter-zonal, and global. Each of these components can have both a natural and an anthropogenic fraction. The input of soil sized particulate Pb, mercury, and Ga to the Eastern Atlantic Ocean is discussed in terms of the differing dust loadings of the major wind systems in relation to the particle model. (Author abstract modified)

60506 **APTIC NO. 82275**

Dams, R. and M. Demuynck

SAMPLING, ANALYSIS AND COMPOSITION OF AIRBORNE PARTICULATE MATERIAL IN BELGIUM. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 409-422. 11 refs. (June 24-28.)*

Aerosols were sampled at 14 Belgian industrial, urban, and rural locations for 1 yr. At each station daily 24 hr samples were taken on cellulose filters. All samples were analyzed for total suspended particulate. A large number of samples from days with relatively constant wind directions were analyzed for 35 elements, including metals and halogens, by instrumental neutron activation analysis using a simplified irradiation-counting scheme. A limited number of these samples were also analyzed for sulfate, nitrate, ammonium, and silicon. The measured constituents, properly summed, accounted for 50 to 75% of the total aerosol mass. The analytical techniques applied included instrumental neutron activation analysis, flameless atomic absorption, and gravimetry. Mean, maximum, and most frequent values at all 14 stations for total suspended particulate and typical chemical compositions were calculated. The variation of the levels over the country and under the influence of meteorological parameters is discussed. The general aerosol level was elevated in most areas of Belgium. The generally much higher ambient air levels in industrial and urban areas gave first indications of the sources of the aerosols. The chemical composition of the aerosols varied as a function of location and wind direction, indicating the existence of important localized emission sources. Intensive area-wide simultaneous samplings in industrial and urban areas revealed strong concentration gradients near metal industries. The chalcophile elements showed especially large concentration gradients. Their general association with the small particles makes them potentially hazardous. Since the elements can be divided into groups with common sources and similar atmospheric behavior, a selected number of indicator elements can be found for each group. (Author abstract modified)

60507 **APTIC NO. 80185**

Elliott, William P., Fred L. Ramsey, and Ralph Johnston

PARTICLE CONCENTRATIONS OVER THE OCEANS. *J. Rech. Atmospheriques, 8(3-4):939-945, July-Dec. 1974. 7 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Particle concentrations were measured over the oceans from the Glomar Challenger. A figure less than 500/cu cm is typical of open ocean sites. Near land areas the concentrations exceed 1000/cu cm, even off the west coast of continents in mid-latitudes. At a given location the particle concentrations are log-normally distributed with a standard deviation of 0.5 in the logarithm of the concentration. (Author abstract)

60508 **APTIC NO. 76039**

Khuzanov, G. K., O. P. Petrenchuk, and V. M. Drozdova

CHEMICAL COMPOSITION OF ATMOSPHERIC AEROSOLS IN SOME REGIONS OF CENTRAL ASIA. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 9 refs. Translated from Russian, 11p.*

The chemical composition and size distribution of the soluble fraction of aerosols at ground level in Namangan in Central Asia were determined, and soil subject to dust storms was found to be the main source of aerosols in the region. Samples were taken in Namangan and at the outskirts of the city. The soluble fraction of the atmospheric aerosol was 12-25%; samples of soil contained an average of 6% soluble substance. The ratios of ions characteristic of the soil are maintained in the aerosol. Under conditions of a dust storm and high wind speeds, the aerosol content in the air increases significantly, and the increase is accompanied by a notable increase in the content of the soluble fraction and in the contribution of the finely dispersed aerosols to the total concentration. The ions measured in the aerosol were sulfate, chloride, nitrate, bicarbonate, ammonium, sodium, potassium, magnesium, and calcium.

60509 **APTIC NO. 82185**

Kneip, Theo J., Merril Eisenbud, Michael Kleinman, and David Bernstein

STUDIES OF TRACE SUBSTANCES IN AN URBAN ATMOSPHERE. *Commission of the European Communities, Luxembourg (Belgium), Health Protection Directorate; Environmental Protection Agency, Washington, D. C.; and World Health Organization, Geneva (Switzerland), Recent Adv. Assess. Health Eff. Environ. Pollut. Int. Symp. Proc., Paris, France, 1974, p. 431-450. 8 refs. (June 24-28.)*

Trace substances in New York City s atmospheric particulates were investigated using an airborne particulate sampling system capable of continuous operation for 7 days at 0.57 cu m/min constant flow. Weekly samples were collected at 4 locations for atomic absorption spectrophotometry analysis, successfully averaging out short-term fluctuations. Weekly dustfall samples from each station were analyzed for 9 metals, and monthly composites for additional elements or ions. Methods to quantitatively analyze trace element concentrations in suspended particulates, settled dust, and human tissue specimens were studied and tested, using reference materials. Correlations of the composition and total suspended particulate (TSP) variations have shown associations to exist between lead, vanadium, copper, sodium, and potassium and some 40% to 65% of the total aerosol. The aerosol associated with lead, and possibly automobiles, accounts for 20 to 30% of the total; that associated with vanadium, and probably oil burning, for 10% to 14%. A means has been evaluated for correcting for meteorological variations, revealing previously obscured distinct source-related seasonal variations, reflecting space heating and closely correlating mathematically to degree day data. The annual space heating contribution was calculated at about 20% annually from these results and agrees fairly well with the 10 to 14% estimated through the correlation method. Dustfall deposition velocities were determined for several elements, and the associated particle size estimated using a Stokes Law approximation. Copper is apparently on relatively large particles, 1.8 micron mass median diameter (mmd); nickel and vanadium, believed to originate as fumes from oil burning, have mmd less than 1 micron. (Author abstract modified)

60510 **APTIC NO. 72657**

Lahmann, E.

MEASUREMENTS OF AUTOMOBILE EXHAUST GAS COMPONENTS IN BERLIN. *(Messungen von Kraftfahrzeug-Abgasbestandteilen in Berlin). Text in German. Schriftenreihe Ver.-Wasser-Boden-Lufthyg. (Berlin), vol. 42:91-100, 1974. 20 refs.*

The results of carbon monoxide, nitrogen dioxide, lead, and hydrocarbon concentration measurements in different places in West Berlin are presented. The CO concentrations showed close correlation with the traffic density, and decreased logarithmically with altitude above street level. The 30-minute averages obtained in tunnels were often higher than 100 ppm. The total hydrocarbon concentration was 17 ppm as a 30-minute average, and the hourly average formaldehyde concentration amounted to 0.04 mg/cu m. Some 3% of all NO2 concentrations were above 0.1 mg/cu m, and 0.22 mg/cu m was measured in a tunnel. The highest lead concentrations were between 0.9 and 4.3 micrograms/cu m in streets, and between 4.9 and 24.9 micrograms/cu m in tunnels. The CO and nitrogen oxides concentrations were considerably reduced during Sunday traffic bans in areas with otherwise busy traffic, but not in areas with generally low background concentrations.

60511 **APTIC NO. 79905**

Leibecki, Harold F., Robert B. King, and J. Stuart Fordyce

AERODYNAMIC SIZE DISTRIBUTION OF SUSPENDED PARTICULATE MATTER IN THE AMBIENT AIR IN THE CITY OF CLEVELAND, OHIO (TECHNICAL MEMORANDUM). *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center,* *Work unit 770-18, Rept. NASA TM X-3124, Rept. E-8024, 15p., Oct. 1974. 13 refs.*

NTIS: N-74-34821

Measurements were made of the particle size distributions of ambient air samples at five locations in Cleveland, Ohio during August and September 1972. High volume cascade impactor heads operating on conventional high volume samplers were used. Sampling locations were chosen to represent industrial, commercial, mixed light industrial-residential, and residential-commercial sites to the west and east of the city center. Twenty-one 24-hour samples were obtained at each site. Mass median diameters ranged from about 2 to 7 micron. The average lognormal distribution of particle diameters was 37% by weight above 7 micron, 15% by weight from 3.3 to 7, 7% by weight from 2 to 3.3, 10% by weight from 1.1 to 2, and 31% from 1.1 to the approximate 0.01 micron limit of the backup filter. The largest mass median diameter was associated with an industrial source and the smallest with residential areas. Junge type number size distributions were consistent with dirty continental aerosols. (Author abstract modified)

60512 APTIC NO. 84379

Mason, Peter F.

THE DISTRIBUTION OF AIR POLLUTION IN CALIFORNIA: A STUDY IN SPATIAL INTERACTION. *J. Geogr., 73(9):30-37, Dec. 1974. 29 refs.*

The distribution of air pollution in California is discussed along with a method for mapping air pollution in terms of a spatial interaction model and air quality indices. Base data consisting of three month averages in the air quality index are mapped for selected cities and reveal generally higher pollution values for four areas of the state: the San Francisco Bay metropolitan area, the Sacramento-San Joaquin Delta, the Southern California metropolitan area, and the Bakersfield area. San Jose and Los Angeles, the two largest metropolitan regions, exhibit the greatest pollution. The observed air pollution distribution is explained in terms of meteorological and topographical factors and sources of air contaminants.

60513 APTIC NO. 73533

Miranda, Henry A., Jr. and R. Fenn

STRATOSPHERIC AEROSOL SIZES. *Geophys. Res. Lett., 1(5):201-203, Sept. 1974. 4 refs.*

NTIS, DDC: ADA000976

A submicron aerosol counter was flown on three stratospheric balloon experiments over Holloman Air Force Base, New Mexico to obtain information on stratospheric aerosol size distributions. Particulate matter at altitudes above 23 km showed markedly different scattering parameters from particles at lower levels, with the differences being manifested in the form of increasingly steeper size distributions and a lack of particles larger than 0.4 micron in diameter. Thee extent to which these features were attributable either to nonspherical parameters or to particle index of refraction uncertainties rather than to the actual size distribution wass not determined. (Author abstract modified)

60514 APTIC NO. 81850

Mishra, U. C. and R. R. Kamath

ENVIRONMENTAL TRACE ELEMENT DETERMINATIONS BY INSTRUMENTAL NEUTRON ACTIVATION METHODS. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 402-412. 6 refs. (July 29-31.)*

NTIS: CONF-740701

The results of neutron activation trace element analyses of airborne particulate samples collected at seven country-wide stations throughout India during 1973 are presented. The average annual concentrations for sodium, scandium, chromium, iron, cobalt, zinc, antimony, lanthanum, and cerium ranged from 577-3190 ng/cu m, 0.9-3.7 ng/cu m, 8.6-138 ng/cu m, 23.0-335 ng/cu m, 2.6-21.8 ng/cu m, 18.0-183 ng/cu m, 2.0-21.4 ng/cu m, 1.1-17.4 ng/cu m, and 2.4-31 ng/cu m, respectively. The highest concentrations of these elements were generally found in the Bombay area. Average monthly concentrations are also displayed in graphical form.

60515 APTIC NO. 76563

Mizokoshi, Toshio, M. Era, and Noboru Mizoguchi

DETERMINATION OF DUSTFALL AMOUNTS. *(Koka baijin ryo no sokutei). Text in Japanese. Oita-ken Kogai Eisei Senta Nenpo (Ann. Rept. Environ. Pollut. Public Health, Oita Prefect.), no. 1:53-62, Nov. 1974. 2 refs.*

Results of dustfall measurements at 21 locations in Oita prefecture during 1971, 1972, 1973, are tabulated. Deposit gauges were used to measure total amounts for each month. Amounts of soluble and insoluble components were measured. When there was heavy rainfall, or sea breezes, the amount of soluble components increased considerably. Monthly average dustfall (ton/sq km/month) for 1973, averaged for 12 months, gave the following results: in the Oita region, dustfall ranged from 3.46-8.00; highest dustfall was recorded in industrial areas (6.87-8.00). In the Sagonoseki region, where there is a foundry, dustfall in 1969 was 20.83. In 1973, dustfall was 8.63. Two cities, Beppu and Nakatsu, had very little dustfall (3.55-4.98).

60516 APTIC NO. 73323

Muramatsu, Fumio

ATMOSPHERIC METAL CONCENTRATION IN YOKOHAMA, KAWASAKI, AND YOKOSUKA INDUSTRIAL AREA. *(Kanagawa-ken rinkai kogyo chiku ni okeru taikichu kinzoku seibun no koiki bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):528, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 376.)*

Airborne particulates were collected from three cities in Kanagawa Prefecture using high-volume samplers with and without cyclone. Analysis was made for iron, manganese, vanadium, titanium, nickel, and chromium by an X-ray fluorescence technique for a 2-week period in both the summer and winter. All data are presented as the average of three cities. All metals analyzed showed higher concentration in winter than in summer, and this difference was more extreme for Pb, Ti, and Mn; the summer analyses gave 0.154, 0.209, and 0.094 micrograms/cu m for Pb, Ti, and Mn, respectively, and the winter analyses gave 0.243, 0.386, and 0.172 micrograms/cu m using high-volume samplers without cyclone. The trapping efficiencies of Fe and Ti were larger for the sampler without cyclone, and the sampler with cyclone trapped more effectively for Pb, V, and Ni. The contents of Fe and Ti in particulates decreased considerably with rain, while the Pb content increased with rain. The decrease observed in Ti could be due to the inhibitory effect of rain on Ti updraft from soil. The observed percentage of metal content in particulate matter by the sampler without cyclone for summer experiments was 3.95, 0.128, 0.072, 0.029, 0.166, 0.034, and 0.017% for Fe, Pb, Mn, V, Ti, Ni, and Cr, respectively, and the winter experiments gave 4.14, 0.150, 0.106, 0.024, 0.245, 0.027, 0.021% respectively.

60517 APTIC NO. 73414

Nakazawa, Y., A. Momose, H. Kurita, I. Hirosawa, T. Sato, R. Satsuma, and H. Uchida

SURVEY OF ATMOSPHERIC POLLUTION BY MOBILE ANALYZER, AOZORA 1973. *(Kogai sokuteisha, Aozora, ni yoru taiki osen chosa (Showa 48-nen)). Text in Japanese. Chosa Kenkyu Hokoku, Nagano-ken Eisei Kogai Kenkyusho (Rept. Res. Surv., Nagano Prefect., Inst. Public Health, Japan), no. 117:1-172, June 1974. 2 refs.*

Results of measurements on atmospheric pollution, taken with a mobile analyzer from March to December 1973, at 15 locations in Nagano Prefecture Japan, are collected in this volume. The mobile analyzer was equipped to measure the following: wind direction and velocity; temperature and humidity; airborne particulates; sulfur dioxide; nitric oxide (NO); nitrogen dioxide (NO_2); hydrocarbons; photochemical oxidants; and carbon monoxide. Traffic conditions, noise, topographical and meteorological data were also collected. Continuous measurements at each location were taken over 48-hour periods in turn. In other words, some locations were monitored in March; others were not monitored until November. During the three years (1971, 1972, 1973) this survey has been in operation, maximum average concentrations of airborne particulates and NO have increased annually. Slight increases have been found for carbon monoxide and nitrogen dioxide. No discernable changes have been observed in maximum average concentrations of SO_2, hydrocarbons, and photochemical oxidants.

60518 **APTIC NO. 82237**

Oyama, Minekichi, Asataka Moriyama, Hideki Miyazato, and Harunori Sakugawa

POLLUTION SITUATION BY SULFUR DIOXIDE. *(Aryusan gasu ni yoru osen jokyo). Text in Japanese. Okinawa-ken Kogai Eisei Kenkyusho-ho (Okinawa Prefect. Res. Inst. Pollut. Health), no. 8:35-38, 1974.*

Some data on the status of sulfur dioxide pollution in Okinawa Prefecture are given. Seven major stationary pollution sources in the southern part of the prefecture include 4 power plants and 3 petroleum industry plants. At present, the amounts of sulfur dioxide emissions are less than the national environmental standards. Daily average values are less than 0.02 ppm, and maximum hourly values are about 0.05 ppm. Topographical and meteorological conditions contribute to movement of pollutants away from the area. However, there seem to be situations where the prefectural standards (0.016-0.018 ppm sulfur dioxide) are not being met. Sulfur dioxide concentrations measured at four monitoring stations showed that average values varied very little with time, but there occurred one or two peaks for maximum values, which shifted with respect to time. The city of Naha had highest average values of sulfur dioxide (2.3 pphm).

60519 **APTIC NO. 81969**

Paciga, J. J., A. Chattopadhyay, and R. E. Jervis

ENVIRONMENTAL MONITORING NEAR URBAN LEAD REFINERIES BY PHOTON AND NEUTRON ACTIVATION ANALYSIS. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 286-300. 17 refs. (July 29, 30, 31.)*

NTIS: CONF-740701

Multielement analyses of airborne particulates, soil, and human hair samples collected near two secondary lead refineries in Metropolitan Toronto were performed with neutron activation and photon activation techniques. Increases in the concentrations of lead, arsenic, and antimony were associated with particles greater than 3.3 micron in diameter on certain days near the refineries and resulted in localized contamination as reflected by higher concentrations of these elements in the soil. An analysis of 250 hair samples for lead revealed that children living close to the refineries, particularly boys, exhibited elevated lead levels that were up to 20 times urban control values in some cases. A median lead concentration of 61 ppm was observed in boys under 16 yr old as compared with 37 ppm for girls under 16 yr. Different outdoor play habits and interior personal hygiene practices were probably important factors affecting this difference. (Author abstract modified)

60520 **APTIC NO. 76037**

Petrenchuk, O. P. and R. F. Lavrinenko

CHEMICAL COMPOSITION OF AEROSOLS ON THE CRIMEAN SEASHORE. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 8 refs. Translated from Russian, 15p.*

The chief constituents of aerosols on the Crimean seashore, determined from samples taken at four measuring stations, are sodium chloride particles, whose concentration decreases with increasing distance from the shore, and calcium sulfate particles, whose concentration is practically independent of distance from the seacoast. The observed ratios of chloride ion to sulfate radical and sodium ion to calcium ion suggest that during the evaporation of seawater and the initial stages of marine aerosol formation, the aerosols are enriched with sulfates and have an ionic composition different from that of seawater. The contribution from the NaCl particles is especially notable for an increase in the total concentration of the soluble part of the aerosols. For small values of the total concentration (50 microgram/cu m), the fraction by weight of $CaSO_4$ particles exceeds the fraction of NaCl. The NaCl particles are mainly polydisperse, with a predominance of the large fraction. The NaCl concentration is determined by the extent to which salts are removed from the surface of the sea, and is dependent on wind speed. Sulfates are present in aerosols mainly in the form of finely dispersed $CaSO_4$ particles, and their concentration is almost independent of wind speed.

60521 **APTIC NO. 72666**

Umeda, H. and N. Takata

ON THE ENVIRONMENTAL CONCENTRATIONS OF FORMALDEHYDE. *(Kankyo ni okeru horumuarudehido nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):584, Nov. 1974. 1 ref. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 434.)*

Environmental formaldehyde concentrations were measured during November 1972 and July-August 1973, at Takarazuka City, Japan. Summer concentrations were three times autumn concentrations. The increase is probably due to substances formed from secondary reactions dependent on ambient temperature and intensity of ultraviolet radiation. The highest daily summer formaldehyde concentrations (highest overall concentration, 71 ppb) usually appeared between 9-10 am and highest daily autumn concentrations (highest overall concentration, 23 ppb) usually appeared between 11-12 am. Lowest overall concentrations were 4 ppb for summer and 0 ppb for autumn. Maps of wind direction and concentration distributions are included.

60522 **APTIC NO. 72655**

Unno, K., T. Ro, Y. Furukawa, and Y. Hattori

OBSERVATIONS ON THE REMOVAL OF HEAVY METALS IN AIRBORNE DUST PARTICULATES BY AIR FILTERS. *(Eafiruta ni yoru taiki fuyu funjinchu no jokyo ni tsuite no ichi kosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):592, Nov. 1974. (Presented at the National Air Pollution Research Conference 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 441.)*

The removal of seven metals (iron, manganese, lead, nickel, zinc, cadmium, and vanadium) air filter (combination of high capacity filter and activated carbon filter) was investigated for 2-day periods from Aug. 1973 to April 1974. The removal rate of Ni was negligible. Removal rates for Mn, Pb, and Cd were relatively high, and correlated well with the removal rates of total dust particulates. Removal rates of Fe, Zn, and V depended on the days measurements were taken, and there was no particular correlation with dust removal rates. It seems possible that Mn, Cd, and Pb arise from constant pollution sources, whereas pollution sources for Fe, Zn, V are varied, and cause the latter metal particles to exist in varying forms in the air.

60523 **APTIC NO. 81849**

Winchester, John W., Dennis L. Meinert, J. William Nelson, Thomas B. Johansson, Rene E. Van Grieken, Celso Orsini, Henry C. Kaufmann, and Roland Akselsson

TRACE METALS IN THE ST. LOUIS AEROSOL. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 385-394. 3 refs. (July 29-31.)*

NTIS: CONF-740701

The elemental composition of the St. Louis aerosol was investigated at rooftop sites in south and central locations in the city. Particle size distributions of sulfur, chlorine, potassium, calcium, titanium, vanadium, manganese, iron, copper, zinc, bromine, and lead were measured in samples from 0.7 cu m of air collected over 12-hour intervals at a 1 l/min flow rate. The precision of individual analyses was generally between 10-30%, except near the nanogram detection limit. Some elements like calcium, iron, titanium, and potassium showed a tendency for highest concentrations in the largest particle size fractions, with the pattern of distribution of concentration with size being relatively invariant. Their entry into the atmosphere was probably accounted for by predominantly dispersion source processes. Other elements like sulfur, lead, and zinc showed substantial proportions of the atmospheric concentrations in the smallest particle size fractions and demonstrated greater variability in particle size distribution patterns, suggesting aerosol formation processes of vapor condensation at high or low temperatures. A change from low speed and mostly southerly air flow (with evident haze and air pollution) to higher wind speed and an air flow shifting from the west to the east (improved visibility and air quality) was associated with drops in the concentrations of titanium, iron, calcium, potassium, and sulfur at the south site and titanium at the central site. This latter observation indicated the transport of air pollution from industrial sources south of the city. (Author abstract modified)

60524 **APTIC NO. 80098**

Yano, N., H. Katsuragawa, and K. Maebashi

ASSESSMENT OF SOURCES OF MARITIME AEROSOLS BY NEUTRON ACTIVATION ANALYSIS. *J. Rech. Atmospheriques, 8(3-4):807-817, July-Dec. 1974. 9 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Samples of maritime aerosols were collected aboard ship in the Pacific Ocean during Aug. 1970 and analyzed to assess the background pollution. A cascade impactor was used for sampling and each sample was analyzed by instrumental neutron activation analysis. The elements determined included: sodium, chlorine, aluminum, manganese, and vanadium. The greater part of the large particles (0.08 micron less than r less than 0.8 micron) is accounted for by sea salt particles, soil and rock debris, and man made particles. The total mass of man made particles, which are concentrated in submicron sizes, are 4 and 9% of the total mass of maritime aerosols. (Author abstract modified)

60525 **APTIC NO. 73182**

Osaka Environmental Pollution Monitoring Center

REGIONAL OXIDANT CONCENTRATION DETERMINED BY RUBBER CRACKING METHOD. *(Gomu kurakkingu-ho ni yoru chiikibetsu okishidanto nodo chosa). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog.), vol. 1:239-245, 1974.*

As a part of studies on the formation mechanism of photochemical smog in Osaka, the regional distribution of oxidant concentration was measured by the rubber cracking method. The oxidant concentration was measured at 180 locations during the period of May 1972 to Jan. 1973. The rubber piece, 8 by 5 by 16 mm and suspended in a shelter, was exposed for 10 days, and the crack depth was measured using microscopy at 100 magnification. The variation in rubber cracking value showed little difference by regions. The average value was highest during the period of June to Sept. and decreased gradually, showing the lowest value in Dec. The regions with higher average value from July to Sept. are located at the southern part of Osaka Prefecture. The relationship between rubber cracking value and oxidant cumulative concentration was linear.

60526 **APTIC NO. 74101**

Kyoto City (Japan), Dept. of Environmental Pollution Countermeasures

ON SURVEY RESULTS OF ATMOSPHERIC CARBON MONOXIDE (CO) CONCENTRATIONS ON STREETS. *(Gairo kukichu no issanka tanso (CO) nodo chosa no kekka ni tsuite). Text in Japanese. In: Kyoto-shi ni Okeru Kogai Gyosei no Ayumi: Kogai Kankei Koho Shiryoshu, p. 49-51, Feb. 22, 1974.*

A daytime survey of atmospheric carbon monoxide (CO) concentrations in Kyoto City, Japan was conducted in August 1974, at 95 street locations and 10 municipal monitoring stations. Sampling bags were used to collect 1-hour samples for a continuous period of 8 hr. Eight-hour average CO values ranged from 0.9-12.0 ppm, and did not exceed national environmental standards (below 20 ppm). A maximum 1-hour value of 28.9 ppm CO was recorded, and 12 locations reported values above municipal environmental standards (1-hour value below 10 ppm). The average CO value for 15 highway locations was 5.0 ppm; values ranged from 2.4-8.7 ppm. Since Oct. 1972, the average value of CO for the entire city has been more or less constant; the Aug. 1974 value was 4.6 ppm. About 25% of the CO concentration measurements fell between 3.0-3.9 ppm.

60527 **APTIC NO. 80115**

Funabashi Municipal Office (Japan), Dept. of Environmental Pollution Control

AIR POLLUTION. *(Taiki Osen). Text in Japanese. In: Environmental Pollution Survey Report in Funabashi City in 1974, p. 25-85, April 1974.*

The yearly average sulfur dioxide concentration in Funabashi measured by lead dioxide method at 12 locations ranged from 0.36 sulfur trioxide mg/100 sq cm/day at the Maehara elementary school to 0.81 SO3 mg/100 sq cm/day at the Kaso Transformer Substation. The highest monthly average SO2 concentration measured by the conductivity method at 8 locations was 0.036 ppm in May at the Katsushika junior high school. The average airborne particulates concentrations measured at 8 locations ranged from 0.03 mg/cu m at Toyotomi Nokyo and the Takane elementary school to 0.05 mg/cu m at 3 locations. The highest hourly value of airborne particulates concentration was 0.99 mg/cu m at the Takane elementary school. The highest average oxidants concentration was 0.044 ppm in November at the Funabashi municipal office. The yearly average nitrogen dioxide concentrations ranged from 0.029 ppm at Mitsuyama Tower to 0.070 ppm at the Takanedai second elementary school. The monthly average carbon monoxide concentration at Nippon Life Insurance building ranged from 1.6 ppm in June to 3.7 ppm in May.

60528 **APTIC NO. 82107**

Nagasaki Prefectural Government, Environment Div.

INVESTIGATION REPORTS ON AIR POLLUTION IN 1973. *(Showa 48 nendo taiki osen chosa kekka). Text in Japanese. 176p., 1974.*

The 1973 measurements of air pollution throughout the Nagasaki Prefecture are given for sulfur oxides, airborne particulates, settling dust, nitrogen oxides, photochemical oxidant, and carbon monoxide. The comparison of these data with those of previous years is given by area. The fuel oil consumption by area in 1973 is also presented.

60529 APTIC NO. 83676

SURVEY ON AEROSOL AND HEAVY METALS. *(Fuyu funjin to jukinzoku no chosa kekka). Text in Japanese. In: Rept. of Kanagawa Prefecture Coastal Area Air Pollution Survey Association, p. 102-122, Dec. 1974.*

Using a high volume cyclone air sampler, aerosol less than 10 microgram in diameter was collected and analyzed from 23 spots in the coastal area of Kanagawa prefecture. In Kawasaki, for both summer and winter, the concentration was about 200 microgram/cu m, while in southern Yokohama in summer it was 100 microgram/cu m, but in winter, 200 microgram/cu m. In Yokosuka in summer, it was 50-100 microgram/cu m, and 100-150 microgram/cu m in winter. The doubling of concentrations in winter is attributed to wind direction; there are south winds in summer and north winds in winter; the former dilute pollution, and the latter transporting pollution from the center of the coastal industrial area to the southern part of Kanagawa prefecture. By X-ray fluorescence analysis, heavy metals from dusts and aerosols were identified and measured, including iron, lead, manganese, vanadium, titanium, nickel, and chromium. All heavy metal concentrations increased in winter, but there was no clear-cut local difference as in summer. This is attributed to the fact that, compared to summer, there were more days when a north wind blew in winter, and the average wind velocity was about 5 m/sec, about double the velocity in summer; also, there were more dry days. Iron and titanium were found in particulates of greater diameter, and lead, vanadium and nickel were found in finer particulates and in greater quantity. Since 0.5% of titanium is contained in soil, on rainy days, when it does not fly up into the atmosphere, there will be less titanium contained in dust; the same is true of lead, the main source of which is automobiles.

60530 APTIC NO. 83867

Nagasaki Prefectural Government (Japan)

PRESENT STATUS OF ENVIRONMENTAL POLLUTION AND ITS COUNTERMEASURE. *(Kogai no genkyo to sono taisaku). Text in Japanese. In: Nagasaki Prefectural Environmental White Paper for 1973, p. 9-35, 1974.*

The Nagasaki Prefectural Government has issued a report on the present state and policy for air pollution in its Environmental White Paper for fiscal year 1973. Environmental standards for nitric oxide and photochemical oxidants (a daily average of below 0.02 ppm/hr and 0.06 ppm/hr respectively) were established in addition to the already existing standards for sulfur oxide, suspended particulate matter, and carbon monoxide. There are no reported cases of damage to humans caused by air pollution in Nagasaki Prefecture; however, popular complaints related to air pollution are inclined to rise every year in urban Nagasaki and Sasebo where industrial activities and the consumer economy are ever improving. The emission of sulfur oxides in 1972 (650,000 N cu m/yr) was smaller than that in 1971 (950,000 N cu m/yr), however high concentrations of sulfur oxide were measured (in the range of 0.210 to 0.300 ppm) continuously for 12 to 15 hr on December 22, 1972. High concentrations of sulfur oxide coincide with the following meteorological factors: winter time, when houses are heated, and wind velocity below 2 m/sec when pollutants in the air cannot be dispersed. Also, 496 plant inspections were made to instruct and inspect the plants so that they can comply with the soot and dust emission standard enforced since June 25, 1972.

60531 APTIC NO. 84221

Ikuyukai Pollution Research Institute (Japan)

SURVEY OF AIR POLLUTION AROUND HEAVY AND CHEMICAL INDUSTRIAL AREA IN TOKYO-YOKOHAMA. *(Keihin jukagaku kogyo chitai shuhen no taiki osen no chosa). Text in Japanese. Ikuyukai Kogai Kenkyusho Shoho (Rept. Ikuyukai Inst. Environ. Pollut.), p. 1-18, Aug. 10, 1974.*

In the Second High School established by Hosei University, students conducted measurement of sulfur oxides, sulfur dioxide, and a survey by means of questionnaire of citizens to find the relationship between air pollution and their health, the relationship between sulfur oxides and changes in plants, and the correlation between nitrogen dioxide, noise, and distance from highways. Sulfur oxides concentration was measured from Jan. 1970 to Jan. 1974 (5 times in Jan., 4 times in August during this period), utilizing students winter and summer vacation, in 30 areas, with 1927 monitoring spots in Jan. and 1827 in August. Kawasaki City has the highest concentrations with 0.048 ppm in Jan. and 0.067 ppm in August. Yokohama City had 0.043 ppm in Jan. and 0.049 ppm in August. Plotting these figures on the map, it is found that the Kawasaki Ward of Kawasaki City, with its heavy and chemical industry, has the highest concentration, 0.082 ppm in Jan. and 0.093 ppm in Aug. Nitrogen dioxide concentration was measured in Jan. and August of 1973 and in Jan. of 1974 in 30 areas. The intermediate target to be reached for 12 high concentration pollution areas in Japan is a daily average hourly figure to be 0.04 ppm, to be reached by April 1978. However, most big cities exceed this standard, reaching 10-20 times the standard at times. There seems to be some correlation between NO2 and sulfur oxides concentration.

1973

60532 APTIC NO. 73490

Andreasson, Kenth and Bengt Steen

A STUDY OF AIR-BORNE PARTICULATE MATTER ON THE SWEDISH WEST-COAST. CORRELATION BETWEEN PARTICLE CONCENTRATION WITHIN DIFFERENT PARTICLE SIZE RANGES AND TOTAL PARTICULATE SULFATE AND SULFUR CONCENTRATIONS. *Swedish Water and Air Pollution Research Lab., Gothenberg (Sweden), Rept. B 146, 13p., Dec. 1973. 6 refs.*

Airborne particulate samples from an unpolluted, non-urban area in Sweden were analyzed for total sulfur and sulfate concentration which in turn were correlated with particle size. The median water-soluble sulfate concentration for the material collected was 6.5 micrograms/cu m, and the medium sulfur concentration was 6.2 micrograms/cu m. Sulfates correlated highest with particle diameters in the 0.3-0.4 micron range (correlation coefficient of 0.90); sulfur also correlated highly (0.88) with this size range. The high correlation between water-soluble sulfate concentration and sub-micron particle size suggested that the sulfate aerosols were formed in the air as opposed to being emitted in that form from some source. A mathematical expression was derived that allows for the estimation of total soluble particulate sulfate concentration in the air with a standard deviation of less than 7% using a particle counter.

60533 APTIC NO. 79256

Court, J. D.

AIR QUALITY -- NOW AND THE FUTURE. *Aust. Refrig., Air Cond. Heat., vol. 1973:18-20, 42, June 1973. (Presented at the AIRAH Conference, Sydney, Australia, 1973.)*

Smoke concentration, sulfur dioxide, and dust deposition have been monitored on a regular bases at a large number of sites in New South Wales for many years. Smoke concentration determinations were made in N.S.W. until 1971 by measuring optical density of the stain produced by drawing a known quantity of air through a filter paper; however, later measurement has been by reflectance. Present smoke levels are low by world standards, and only marginal improvements seem likely. The character of fine suspended material in the atmosphere may change due to the increasing proportion arising from photochemical smog. Sulfur dioxide results primarily from the combustion of industrial fuels containing sulfur. The use of fuel oil with a sulfur content in excess of 1% is prohibited for new plants installed on scheduled premises from January, 1973. Dust collected in deposit gauges is analyzed monthly as insoluble solids, combustible matter, and ash. The downward trend in Sydney and Newcastle can be largely attributed to the implementation of the Clean Air Act in respect to the more obvious heavy particulate emissions. Carbon monoxide and ozone are being monitored continuously. The carbon monoxide level in the Sydney central business district is unacceptably high. Particulates can be removed by the sophisticated filtering and gas cleaning equipment used in air conditioning. Building air intakes should be positioned as far as possible from traffic movements while avoiding stagnant pockets of air.

60534 **APTIC NO. 72751**

Flyger, H., K. Hansen, W. J. Megaw, and L. C. Cox

THE BACKGROUND LEVEL OF THE SUMMER TROPOSPHERIC AEROSOL OVER GREENLAND AND THE NORTH ATLANTIC OCEAN. *J. Appl. Meteorol., 12(1):161-174, Feb. 1973. 13 refs.*

Measurements of the background level of the summer tropospheric aerosol over Greenland and the seas surrounding it were performed. Attempts were made to determine the concentration and size of Aitken nuclei, the concentration of cloud nuclei active at a supersaturation of 1%, the concentration of freezing nuclei activated at - 20 C, and the chemical nature of the tropospheric aerosol. The mean of the total Aitken nuclei concentration over the North Atlantic Ocean between Scotland, Iceland, and Greenland was about 600/cu cm. The concentrations were generally less than 1000/cu cm, and the mean size was about 0.000002 cm. Over the ice cap between Kulusuk and Sdr. Stromfjord, the mean of the total nuclei concentration was about 300/cu cm, and the concentrations were generally less than 400/cu cm. The mean size was about 0.000003 cm. Cloud nuclei concentrations were also very low, with nearly 50% of the concentrations measuring less than 10/cu cm. Freezing nuclei concentrations were mostly less than 1/l. The sample volumes taken for activation analysis (500 l) were too low to give reliable results. An analysis of the air mass trajectories suggested that the air masses sampled were of polar or North American origin. None of the sampled air masses appeared to have passed over heavily populated areas within their recent history. (Author abstract modified)

60535 **APTIC NO. 79263**

Georgii, H. W.

THE INFILTRATION OF AIR POLLUTANTS INTO BUILDINGS. *(Ueber das Eindringen von Luftverunreinigungen in Gebaeude). Text in German. Hippokrates (Stuttgart), 44(3):327-329, 1973. 5 refs.*

Studies on the infiltration of gaseous and particulate air pollutants into buildings are reviewed. If doors and windows are closed, the sulfur dioxide, carbon monoxide, and dust concentrations are always lower inside buildings than in the free atmosphere. Sulfur dioxide, being a reactive gas, is readily adsorbed by walls and other surfaces. The indoor SO2 concentration is about 80% of that measured outdoors when its level in the atmosphere is low. In polluted air, i.e., with SO2 concentrations over 1 microgram/cu m, the indoor SO2 concentration is about 30-40% of the outdoor concentration. When the exterior CO concentration is over 10 ppm, the interior concentration is about 60% of this level. Indoor dust concentrations are 30-50% of the outdoor concentration. Air conditioning considerably reduces the overall dust and pollen concentrations inside buildings, but it is practically inefficient regarding gaseous pollutants and dust fractions below 1 micron in size. In general, the indoor pollutant concentrations follow the outside concentration changes with a certain delay, and at a reduced amplitude.

60536 **APTIC NO. 79398**

Halasz, Katalin F., Gyorgy Kiszely, and Istvan Torok

TESTING FOR 3,4-BENZPYRENE IN THE CITY OF SZEGED. *(3,4-benzpyren vizsgalatok Szeged varos teruleten). Text in Hungarian. Egeszsegtudomany, 17(2):134-140, 1973. 15 refs.*

Carcinogenic contamination of the atmosphere was tested in Szeged, Hungary by determining the 3,4-benzopyrene content in road surface dust samples and various snow samples. One gram of the dust contains 0.42 to 4.54 and 0.10 to 3.85 micrograms of 3,4-benzopyrene in winter and summer, respectively. The level of carcinogenic contamination is not high in Szeged compared to similar indices of other Hungarian towns.

60537 **APTIC NO. 67155**

Jost, D. and J. Mueller

COMPARISON OF THE GASEOUS POLLUTANT AND AEROSOL CONCENTRATIONS IN POLLUTED AIR. *(Vergleich der Konzentrationen von Schadgasen und Aerosolen in verunreinigter Luft). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 66-69. 5 refs. (Oct. 17-18.)*

The possibility of the use of leading pollutants for the estimation of one pollutant from the measured concentration of another in the atmosphere by correlation and regression analysis is demonstrated by examples. The increase in dust concentration due to chemical reactions is accompanied by an overall increase in the pollution level. The contribution of sulfur dioxide to the total atmospheric sulfur in Frankfurt am Main was 18 times that of the sulfate sulfur in winter due to prevalent anthropogenic SO2 emission but it decreases in summer against a background of an overall decrease of the atmospheric sulfur level, which is due to a different emission pattern and different chemical reactions. The sulfate gradient shows less pronounced seasonal variation than does the SO2 gradient. The sulfate concentration in the atmosphere is 4 to 10 times higher than the ammonium sulfate actually measured. Close correlation between the atmospheric carbon monoxide and lead concentrations was established, especially for high CO levels.

60538 **APTIC NO. 84374**

Karvonen, M. J.

AIR POLLUTION AND ITS EFFECTS ON HEALTH: HEAVY METALS AND HYDROCARBONS. *Inst. of Occupational Health, Helsinki (Finland), Comp. Study Food Environ. Contam. Proc. Symp., Helsinki, Finland, 1973, p. 65-74. 22 refs.*

Airborne heavy metal and hydrocarbon levels are reported for rural and industrialized sections of Finland. Lead concentrations of 2.1 micrograms/cu m were observed in an industrial area as compared with values of 0.025 micrograms/cu m for a rural area, 1.0 micrograms/cu m for a suburban area, and 1.3 micrograms/cu m for central Helsinki. Mean blood lead levels of men and women living in Finland varied from 11.4-13.2 micrograms/100 ml blood and from 8.5-10.7 micrograms/100 ml, respectively, and were independent of the airborne lead concentration. Mean blood levels for men and women living in industrial areas near lead emitters were 18.1 and 14.3 micrograms/100 ml, respectively. Occupational exposures to lead resulted in blood lead levels ranging from less than 20 to more than 80 micrograms/100 ml blood. Increased cadmium levels were observed in dust emitted by cellulose factories. Inhabitants who habitually ate fish contaminated with methyl mercury showed no untoward effects. An analysis of airborne particulate matter for various polynuclear hydrocarbons revealed benzo(3-4) pyrene levels of 0.9 and 0.5 micrograms/1000 cu m of air at urban and suburban locations, respectively. (Author abstract modified)

60539 **APTIC NO. 83649**

Kitagawa, Y., A. Sueta, K. Kaneda, and Y. Nishida

ATMOSPHERIC POLLUTION IN WAGI-TOWN, KUKA-GUN, IX. *(Kuka-gun Wagicho no taiki osen ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Inst. Health), no. 16:67-68, 1973.*

Measurements were made between Jan. and Dec. 1973 of sulfur dioxide concentrations and fall-out at 6 residential areas. The SO2 concentration was 0.71 - 1.03 mg SO3/day/100 sq cm. The amount of fallout was 2.82 at the Sekigahara Kindergarten and 4.78 ton/sq km/month at the Wagi Public Hall. The data at other sites were between these extremes. The SO2 concentration was lowest at 0.35 mg SO3/day/100 sq cm, in Dec. and highest, at 0.99-1.03, between April and Aug. The amount of consumed heavy oil was 477,000 kl in 1973, compared to 454,000 kl in 1972. However, the SO2 exhaust decreased from 5500 ton to 5200 ton in 1973, because the S content of heavy oil decreased from 1.27% to 1.15%. However, the SO2 concentration in the atmosphere was much higher in 1973 than in 1972. This discrepancy is attributable to the complex geographic structure of Wagi Town. The amount of fallout in this district was related to rain. The amount increased with an increase of the amount of rain; it has decreased for several years. However, heavy oil consumption is expected to increase. The expected consumption in 1978 is 2.7 times that of 1973. Therefore, the installation of desulfurizing apparatus is important.

60540 **APTIC NO. 84680**

Koide, K., K. Sugimura, and Y. Noda

CHANGE IN AIR POLLUTION AT SPECIFIC AREAS OF KUMAMOTO PREFECTURE. *(Kenka no tokutei chiiki ni okeru taiki osen no suii nitsuite). Text in Japanese. In: Annual Report of Kumamoto Prefectural Institute of Public Health, 1971-1972, p. 134-142, Oct. 1973.*

In Kumamoto Prefecture, since 1964, sulfur oxides have been measured by the lead peroxide method (PbO2) and dust by the deposit gauge method. There are 7 monitoring spots at Arao City, 2 at the Nagasu area, 1 in Tamana City, 2 in Udo City, 10 in Yatsushiro City, 10 in Minamata City, and 4 in Taura area. The two at Nagasu and 1 at Tamana are for observing effects of the Hitachi shipbuilding plant which started operation in 1972 and the Fuji aluminum window sash plant which was already in operation. Two out of 4 at Taura were installed after reviewing the damage caused by air pollution. Industry increased equipment to abate air pollution, and the effect has become noticeable. Especially at three major areas, in the past 6 years, with 1970 as a peak year, SOx concentration has gradually decreased, especially at spots nearer the sources. For dust monitoring, 10 spots in Arao City, 2 in Nagasu area, 1 at Tamana City, 2 at Udo City, 6 at Yatsuhiro City, 5 at Minamata City, and 4 at Taura are regularly monitoring the volume of water contained in dust, pH, elements dissolved in water, and total volume of dust. These monitoring spots are the same places where PbO2 test cylinders are placed. Three monitoring spots have been newly installed since cadmium was detected in rice. With strengthened legal control and efforts made on the part of industry, compared with 1972, 1971 figures showed a decrease, but in some places, dust increased. The rate of decrease was not so sharp as the SOx decrease rate. At spots where an increase was observed, it was attributed to the effect of high stacks at sources.

60541 **APTIC NO. 82284**

Kudo, H., S. Wakamatsu, Y. Saiki, K. Nagami, and S. Sugano

ON THE BACKGROUND OF AIR POLLUTANTS LEVEL. *(Taiki osenbutsu nodo no bakku gurando). Text in Japanese. Kanagawa-ken Koshu Eiseigaku Zasshi (Bull. Kanagawa Prefect. Public Health Assoc.), no. 20:47, 1973.*

The nitrogen oxides, ozone, and oxidant levels in the Hakone area, which is thought to have a relatively clean atmosphere were measured and the values compared with those for an industrial area and a busy traffic area. The average values found for NOx were 8, 43, and 50 ppb at the Hakone, the industrial, and the busy traffic areas, respectively, while the ozone levels were 3, 19, and 18 ppb. The oxidants level was 50 ppb for both the Hakone and industrial areas. The variation of the NOx level was large in the industrial area, with a variation coefficient of 1.0 to 2.2 and small in the Hakone area; 0.3 to 0.6. The amount of airborne dust collected at the Hakone area was 2 to 3 times larger than at the Yokohama city area, and 5 to 10 times greater levels of lead, nickel, cadmium, and chromium were found in the former area compared to the latter area. The average airborne dust collected in the Hakone area was 0.147 mg/cu m, and the atmospheric concentrations for Pb, Cd, Ni, and Cr were 0.22, 0.005, 0.021, and 0.003 microgram/cu m, respectively.

60542 **APTIC NO. 79898**

Lisicka, Izabella, Ewa Kolanowska, Walentyna Petecka, and Jadwiga Mlotek

EFFECT OF AUTOMOTIVE EXHAUST EMISSIONS ON AIR POLLUTION IN WARSAW. *(Wplyw spalin samochodowych na zanieczyszczenie powietrza w Warszawie). Text in Polish. Ochrona Powietrza (Warsaw), 7(4):97-102, Aug. 1973.*

Concentrations of gaseous pollutants were measured at hourly intervals and solid aerosol particles at 3-hour intervals between 8 am and 8 pm every first and second Monday of each month in 1970 at two places in center city Warsaw. The average daily concentration of lead varied between 0.4 and 0.79 micrograms/cu m, although about 20% of the samples exceeded the lawful standard of 1 microgram/cu m. The concentration of lead increased with decreasing temperature. Sulfur dioxide is not a typical combustion product. Measured concentrations ranged from about 0.005 mg/cu m in the summer to 0.16 mg/cu m in winter. The concentration of nitric anhydride exceeded the allowed norm of 0.6 mg/cu m in 9 cases out of 241 at one testing place and in 4 cases out of 251 at the other site. Average yearly solid aerosol concentrations reached a maximum of 0.45 mg/cu m in the time interval between 11 am and 2 pm. The maximum concentration of 3,4-benzopyrene in these particles was about 14 micrograms/cu m. Solid aerosol concentration increases with decreasing temperature and increasing humidity. Carbon monoxide concentrations varied from 0 to 9.2 mg/cu m and exceeded the 20- minute allowed standard in 11 out of a total of 84 measurements.

60543 **APTIC NO. 84400**

Lisicka, I.

DUST POLLUTION IN THE VICINITY OF THE CEMENT PLANTS WARSZAWA. *(Zapylenie rejonu Cementowni Warszawa). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(5):49-54, 1973.*

NTIS: TT 73-54096/5

Dust pollution in the vicinity of cement plants in Warsaw, Poland, was measured during the period 1967-1972. Dust fall in an area 100 m from the plants is as high as 2700 ton/sq km/yr, averaging 971 ton/sq km/yr. Composition of the dust is characteristic, showing a lower amount of organic substances in relation to inorganic than in other regions of the city. Aluminum and iron oxides, calcium oxide, magnesium oxide, sulfates, substances insoluble in hydrogen chloride were determined in the dust fall at eight points at 300 to 1000 m. The highest fall of dust was at points near the cement plants in an eastern and northwestern direction. Modernization of the plants, technological processing changes, and installing of dust removal devices is lowering the level of dust pollution in the vicinity of the plants. (Author abstract modified)

60544 APTIC NO. 82866

Nagatsuka, S., H. Chisaka, Y. Tanizaki, Y. Horiguchi, Y. Okano, and T. Suzuki

RADIATION ANALYSIS OF VANADIUM AND OTHER MICRO-ELEMENTS IN RAIN WATER. *(Usui chu no banjin sonota no biryo genso no hoshaka bunseki). Text in Japanese. Tokyo: Aisotopu Sogo Kenkyusho Nenpo (Tokyo Met. Isotope Gen. Res. Inst. Annu. Rept.), p. 27-28, 1973.*

Using a 70-cm diameter polyethylene funnel more than 5 liter of rain water was collected in polyethylene bottles, in Tokyo, surrounding areas, neighboring cities, petro-industrial areas, and remote islands. The sample rain was filtered by an 0.45 micron millipore filter, and the filtered water and dregs on the filter were analyzed separately. To the filtered water, corresponding to 1 liter of rain water, co-precipitated iron hydroxide and aluminum hydroxide were added to condense the micro-elements, which were then filtered. Each filter paper was dried, and a radiation sample was made. A part of the millipore filter was cut off, and the dregs on the filter were used as radiation samples. After 5 min radiation and 3 min cooling aluminum and vanadium contents were estimated. After 10 hr radiation and one day cooling, the arsenic content was estimated. After 20 days of cooling, selenium and other elements were estimated. Vanadium content was the least on the islands, and reached maximum in petro-industial area, ranging from 0.02-7.60 ppb. Most of the V was found in solution, and very few particulates over 0.45 micron were found. Arsenic and selenium reached a maximum in the areas where V was highest, ranging from 0.24-3.87 ppb and 0.006-0.143 ppb respectively. Aluminum behaved independently of V concentration, but was highest in cities or in mountains near cities, ranging from 110-533 ppb. Also more Al was found in dregs (over 0.45 micron particulate) than in solution, in any area. In some areas, river water was analyzed. When V and As in rainwater were 2.1 ppb and 1.9 ppb respectively, those in river water were 0.2-2.0 ppb and 0.5-2.3 ppb respectively. Therefore, V and As in river water must come primarily from rainfall.

60545 APTIC NO. 83522

Noel, Raymond and Willy Duhameau

RESULTS OF A ONE-YEAR MEASUREMENT STUDY OF DUST FALL IN THE LIEGE REGION. *(Resultats d une annee de controle des retombees dans la region liegoise). Text in French. Ann. Mines Belg., vol. 1973:1167-1195, Oct. 1973.*

Based on measurements from 101 stations in the Liege basin (28 in the city itself) during 1972, the average values of total dust fall and sulfuric acid ion concentrations in precipitation were determined for each trimester and for the whole year. Whatever the trimester, the sectors of high pollution were always the same, mainly in the proximity of iron and cement industries. For the former, dust fall exceeded 1.5 g/sq m/day and frequently reached 5 g for certain 28-day periods. In the area of cement industries, dust fall was about 1 g/sq m/day. For the remainder of the basin, the average level of pollution was 200-400 mg/sq m/day. The spread of pollutants from their sources was influenced by wind currents. The average pollution level for the whole year was practically in the same sectors of isopollution; the profile and the distribution of the dust fall was influenced by south-southwest and north-east winds. The division of Liege into 4 sectors shows that the districts located closest to iron plants were the most polluted: about 570 mg/sq m/day. At the center of the city, the pollution rate was 300-400 mg/sq m/day. The sulfuric acid ion content in precipitation samples was due to the concentration of sulfur dioxide in the air and to sulfate dust particles. In most of the basin, the average concentration for the whole year was 40-60 mg/sq m/day, always with the same high-pollution sectors.

60546 APTIC NO. 67081

Perry, John

FASTEN YOUR SEAT BELTS. NO SMOKING. (HAZARDS OF TOBACCO SMOKE). *B. C. (Brit. Columbia), Med. J., 15(10):304-305. Nov. 1973.*

Determinations were made of the concentration of benzo(a)pyrene and carbon monoxide in the air of indoor areas in Vancouver where people customarily smoke. The levels of these compounds in the outside urban atmosphere were also measured at several locations in Vancouver. In all cases, the CO concentration was less than 10 ppm. In the indoor areas heavily polluted with tobacco smoke, concentrations as high as 760 ng of benzo(a)preyene/cu m of air were found. These values are many times higher than any of the benzo(a)pyrene levels found in samples of the outside air, and are also much higher than a published figure of 6.6 ng/cu m expressing the median Jan.-March urban benzo(a)pyrene concentration in the U. S. (Author abstract)

60547 APTIC NO. 79077

Quickert, N. and L. Dubois

SOME FACTORS AFFECTING THE AMBIENT OZONE CONCENTRATIONS MEASURED AT OTTAWA. *Sci. Total Environ., vol. 2:81-87, 1973. 13 refs.*

Ambient ozone concentrations were measured just outside the center of Ottawa, Ontario, Canada from June 1972 to February 1973. Average monthly ozone levels fell on a smooth curve, with maximum concentrations occurring during early summer and minimum concentrations during November. Concentrations of ozone over 100 ppb (maximum 160 ppb) occurred on 9 days during the summer months of June, July, and August; while only 1 day during the remaining months showed a concentration as high as 100 ppb. The daily ozone concentration profiles showed a consistent pattern, with significant differences between weekdays and weekends. The morning minimum during weekends was much less pronounced than that for weekdays, suggesting that some human activity, probably automobile traffic, was responsible for producing pollutants which destroy ozone. Measurements of nitric oxide and nitrogen dioxide concentrations appeared to confirm the role of NO as the pollutant primarily responsible for the destruction of ozone. (Author summary modified)

60548 APTIC NO. 83002

Reay, J. S. S.

AIR POLLUTION. *In: After Keynes. J. Robinson (ed.), Oxford, England, Blackwell, 1973, Chapt. 11, p. 156-174.*

Air quality and pollution emissions data are presented for the United Kingdom. Ground level concentrations of smoke show a reduction of from over 150 micrograms/cu m in 1958 to about 60 micrograms/cu m in 1969. Total sulfur dioxide emissions show an increase of from about 4.5 million tons in 1950 to 5.7 million tons in 1969. No drop in grit and dust emissions from 1963-1970 is apparent, and maximum depositions range as high as 500 mg/sq m/day. Hydrocarbon emissions equal about 180 lb/ton of petrol. Carbon dioxide is increasing globally from about 290 ppm at the beginning of the century to about 320 ppm at present. Continuous measurements of carbon monoxide in busy streets throughout the United Kingdom reveal short term peaks of 100-150 ppm, though levels over 30 ppm occur only about 1.9% of the time. Average daily concentrations of nitric oxide and nitrogen dioxide for a typical London site are 30 and 79 micrograms/cu m, respectively. Annual mean lead concentrations in London are around 3.2 micrograms/cu m, with rush hour concentrations in tunnels being as high as 23 micrograms/cu m. The majority of air pollutants measured in the United Kingdom appear to be the result of fossil fuel power production.

60549 APTIC NO. 81182

Suzuki, M., Y. Endo, M. Kitazume, Y. Yoshinaga, K. Okamura, E. Yonevama, M. Nakamura, and K. Hirano

ANION IN THE SUSPENDED PARTICULATE AT YOKOHAMA CITY. *(Yokohama shinai no fuyufunjin chu no in-ion). Text in Japanese. Kanagawa-ken Koshu Eiseigaku Zasshi (Bull. Kanagawa Prefect. Prefec. Public Health Assoc.), no. 20:48, 1973.*

The nitrate, sulfate, and chloride ions in airborne dusts collected at 7 different places in Yokohama city were analyzed and their correlation with the metal components in the dusts was studied. The airborne dust was collected on a glass fiber filter using a high volume air sampler and the collected dust was dissolved into a water or acid solution for analysis. The nitrate ion ranged from 60 to 100 microgram/cu m with the highest average level observed at a residential area (96.6 microgram/cu m) and the lowest average level found in a rural district (59.5 microgram/cu m), while the level found in the industrial area was between these two (76.6 microgram/cu m). The average levels for chloride ion at the industrial, residential, and rural areas were 88.1, 55.9, and 92.6 microgram/cu m, respectively, and the average levels for sulfate ion were 95.1, 76.6, and 99.5 microgram/cu m. The average amount of dust was similar in all areas; 200 microgram/cu m. The correlation of anion concentrations with metal ion concentrations in the collected dust varied with area. However, the correlation of sulfate ion level with vanadium, manganese, and nickel was similar in all areas, with correlation factors of 0.74 to 0.93 for V, 0.65 to 0.91 for Mn, and 0.35 to 0.80 for Ni.

60550 **APTIC NO. 73360**

Takahashi, Takeo

ANALYSIS OF SULFUR OXIDES, AIRBORNE PARTICULATE, AND NITROGEN OXIDES BY AUTOMATED INSTRUMENT. *(Jidosokuteiki ni yoru iou sankabutsu fuyu funjin chisso sankabutsu ni tsuite). Text in Japanese. Annu. Rep. Environ. Pollut. Res. Cent. Ibaragi ken, no. 6:25-37, 1973.*

Measurements were carried out from April 1973 to March 1974 at Hitachi city and the Kashima area of Ibaragi Prefecture. The yearly average sulfur oxides concentrations at 5 locations at Hitachi city and at 12 locations in the Kashima area ranged from 0.020 to 0.027 ppm and 0.013 to 0.021 ppm, respectively. The highest 1-hour value was 0.33 ppm at the Hitachi Kamimine monitoring station. The airborne particulates concentration at Hitachi city was high in summer and low in winter while that in the Kashima area was high in summmer and early winter. The yearly average concentration ranged from 0.021 to 0.33 mg/cu m at Hitachi to 0.020 to 0.50 mg/cu m in the Kashima area. The yearly average nitric oxide and nitrogen dioxide concentrations at the Hitachi Kamimine monitoring station were 0.010 ppm and 0.019 ppm, respectively. The average NO and NO_2 concentrations at the same above 12 locations in the Kashima area ranged from 0.005 ppm to 0.019 ppm and 0.010 ppm to 0.026 ppm, respectively.

60551 **APTIC NO. 83131**

Warmbt, W. and G. Herrmann

RESULTS OF SULFUR DIOXIDE CONCENTRATION MEASUREMENTS ON THE TELEVISION AND VHF EMITTER TOWER IN EAST BERLIN. *(Ergebnisse von SO_2-Immissionsmessungen am Fernseh- und UKW-Turn der Hauptstadt der DDR). Text in German. Idojaras (Budapest), 77(2):69-79, March-April 1973. 11 refs.*

Results of systematic sulfur dioxide concentration measurements, conducted by means of Novak type automatic SO_2 analyzer at 241 m altitude in East Berlin during the 1969-1971 period, are presented, and compared with simultaneous measurements at other sites. The average SO_2 concentration was 0.11 mg/cu m at 241 m during the October-March period, against 0.13 mg/cu m measured at ground-level at 500 m distance from the television emitter during the same time. During the April-September period, the average concentration was 0.03 mg/cu m at both points. Significant positive correlation was established between the daily average SO_2 concentrations measured at 241 m and the vertical temperature gradients measured at altitudes between 3 and 360 m. The SO_2 concentrations were higher during anticyclones than during cyclones. A distinct influence of wind direction on SO_2 concentrations was found. The SO_2 concentrations tended to decrease with increasing wind speed up to 12 m/sec.

60552 **APTIC NO. 67112**

Sung, Fung-Chiang and Chin-Yuan Chuang

AIR POLLUTION IN TAIPEI CITY. *Tai-Wan I Hsueh Hui Tsa Chih Formosan Med. Assoc., 72(5):267-278, 1973. 31 refs.*

Air quality measurements were made in Taipei from Nov. 1970 to Nov. 1971. The average annual concentration for dust was 17.39 tons/sq km/mo and the concentration of suspended particulate matter averaged annually 277 micrograms/cu m. The values for the industrial area were double these figures. The concentrations of haze and sulfur dioxide were close to the limits of the standard for health. They reached their highest peaks in the morning, decreased in the afternoon, and increased again in the evening. The area with the highest carbon monoxide pollution was in front of the Police Bureau. There were only 5 hr a day in which the concentration was below 10 ppm at ground level, with a maximum value of over 20 ppm from 6-9 pm. The highest seasonal average of SO_2 was 0.062 ppm found in the spring, and the lowest value was 0.033 ppm found in the summer. The highest seasonal values in the downtown area, 1.74 COHS (concentration of haze units)/1000 ft for haze and 22.1 tons/sq km/mo for dustfall, were in the winter. (Author abstract modified)

60553 **APTIC NO. 70624**

Osaka City Government (Japan)

AIR POLLUTION PREVENTION FUNDAMENTAL PLAN - CLEAN AIR PLAN 73. *(Taiki osen boshi kiho keikaku - kurin ea puran 73). Text in Japanese. 81p., Nov. 1973.*

Total consumptions of heavy oil, coal, and coke in Osaka city in 1972 were 2.84 million kl, 53,000 tons, and 743,000 tons, respectively. The largest fuel user was the steel industry followed by ceramic industry chemical industry, and synthetic fiber industry. The total registered automobiles in the city in 1972 was 1.6 million, it almost doubled in the past 7 years. Measurements of the SO_2 concentration at 12 locations showed that up to 48% of the total days failed to meet the new environmental standard of a daily average below 0.04 ppm. At eight monitoring stations throughout the city, from 87.6% to 98.7% of the total days failed to meet the 24-hour value of 0.029 ppm. The 1971 clean air plan was composed of countermeasures for three districts, central, eastern and western Osaka, and automotive exhaust countermeasures. Plants were advised to use desulfurization apparatus and to use fuel containing low sulfur. On-spot checks on automobiles for exhaust conditions were enforced.

60554 **APTIC NO. 82207**

Nagasaki Prefectural Government, Environment Div.

INVESTIGATION REPORTS ON AIR POLLUTION IN 1972. *(Showa 47 nendo taiki osen chosa kekka). Text in Japanese. 157p., June 1973.*

The 1972 measurements of air pollution throughout Nagasaki Prefecture are given for sulfur oxides, airborne particulates, settling dust, nitrogen oxides, photochemical oxidant, and carbon monoxide. The fuel oil consumption by areas in 1972 is also given.

1972

60555 **APTIC NO. 81811**

Gladney, Ernest S., William H. Zoller, Robert A. Duce, and Alun G. Jones

VANADIUM, ALUMINUM, AND MANGANESE IN ATMOSPHERIC PARTICULATES FROM MCMURDO AND SOUTH POLE STATIONS. *Antarctic J. (U. S.), 7(5): 171-173, Sept.-Oct. 1972. 6 refs.*

Atmospheric particulates at the McMurdo and South Pole stations in the Antarctic were analyzed for vanadium, aluminum, and manganese concentrations using neutron activation analysis. Values at the South Pole station were extremely low and averaged 2.0 picograms/cu m for vanadium, 0.6 nanograms/cu m for aluminum, and less than 0.06 nanograms/cu m for manganese. The corresponding values for the McMurdo station ranged from 11-4000, 3.2-480, and 0.14-0.91, respectively. High vanadium-to- aluminum ratios relative to the earth s crust were observed at both locations and were either the result of pollution from aerosols or crustal sources that have higher vanadium-to-aluminum ratio than reported.

60556 **APTIC NO. 81810**

Hartmann, W. K.

POLLUTION: PATTERNS OF VISIBILITY REDUCTION IN TUCSON. *J. Ariz. Acad. Sci., 7(3):101-108, Oct. 1972. 5 refs.*

Visibility measurements and analysis of weather bureau and health department records were made to determine the causes of haze observed in the Tucson, Arizona area. Copper smelting was the main source of pollution responsible for the general degradation of visibility in the Tucson basin and surrounding areas. Pollution from these sources was associated with an often-visible whitish mist which was frequently trapped by inversion layers and was sometimes seen entering the Tucson basin through the Reddington and Tanque Verde Passes. Superimposed on the background of smelter-produced haze were diurnally varying local concentrations of brownish haze which was correlated with rush-hour traffic and which during the morning rush hour in urban Tucson exceeded the effects of smelter-produced haze. The visibility in Tucson was reduced from its typical figure of about 57 mi to around 45 mi during morning rush hours.

60557 **APTIC NO. 50431**

Kitagawa, Y., H. Ryomi, T. Maeda, A. Furukawa, and M. Ito

OVERALL PRE-SURVEY OF INDUSTRIAL POLLUTION IN THE HOFU AREA. *(Hofu chiki sangyo kogai sogo jizen chosa ni tsuite). Text in Japanese. Yamaguchi-ken Eisei Kenkyusho Nenpo (Ann. Rept. Yamaguchi Prefect. Res. Inst. Health), no. 14:76-78, Aug. 1972.*

Sulfur dioxide had an average daily concentration of 0.013-0.008 ppm at 52 spots in the Hofu area of Yamaguchi Prefecture. The average for Aug. 4, 7, and 8 was 0.011 ppm; however, at peak periods it was 0.153-0.033 ppm. During the survey period there were easterly to southeasterly winds with great velocity immediately before and after typhoons. The urban area which was northwest of a pollution source was greatly affected. The aerosol concentation averaged 58 micrograms/cu m for seven spots for the three days; at one spot the environmental standard of 0.1 mg/cu m was exceeded.

60558 **APTIC NO. 47934**

Kumazawa, Y.

THE PRESENT SITUATION OF THE OSAKA PREFECTURAL POLLUTION MONITORING CENTER. *(Osaka-fu Kogai kanshi senta no genkyo). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 8(12):903-911, Dec. 1972.*

The number of monitoring stations has increased each year in Osaka Prefecture; they are set up in peripheral areas, not just in the center of town; also, air pollution has become widespread. Monitoring stations at 15 factories were planned for 1971, and at 28 more factories in 1972. There are now 79 stations in all and 235 stations which receive air pollution warnings. There are two mobile monitoring stations in operation which supplement the monitoring activities of fixed stations and which are mobilized at the request of outlying communities, especially when photochemical smog is complained of by citizens; they also monitor exhaust gases such as carbon monoxide on specific roads. Every 10 minutes, automatically monitored information is fed into computers by telemeter equipment the information is indicated in the monitoring room; every hour, an hourly average is logged. Monitoring items at the station become more and more complicated, so a private company to maintan the monitoring stations was established. An air pollution meteorological center was established at the Osaka Meteorological Observatory on April 1, 1971; it supplies air pollution forecasts twice a day. Urgent warnings concerning sulfur oxides, nitrogen dioxide, aerosols, and oxidants are issued, but not on carbon monoxide. Smog warnings were issued five times in 1965, six in 1966, seven in 1967, six in 1968, 12 in 1969, 22 in 1970, and 12 in 1971. A pollution monitoring center which would store observed data, information concerning sources, analyses, meteorological data, damages, and data of other Prefectures using a computer system is planned in Osaka Prefecture.

60559 **APTIC NO. 73602**

Purushothaman, Krishnier

AIR QUALITY STUDIES OF A DEVELOPING LEAD SMELTING INDUSTRY. *Preprint, Society of Engineering Science, St. Louis, Mo., 13p., 1972. 5 refs. (Presented at the Society of Engineering Science Meeting on Pollution: Engineering and Scientific Solutions, 1st, International, Tel Aviv, Israel, June 12-17, 1972.)*

Measurements of sulfur dioxide and dust fall were made in an area adjoining a lead smelter in southeastern Missouri. The cumulative frequency of exceeding 0.1 ppm SO_2 was 30% in the summer and fall at a station 7000 ft (Bixby) from the smelter and 40% at a station 1000 ft (MACC) from the smelter. The particulate Pb was as high as 20.5 g/sq m/mo at one station with an annual average of 8.6 g/sq m/mo. Three locations within a distance of 1000 ft from the stack showed high deposition rate compared to other stations. The annual average deposition rates of particulate zinc, copper, and cadmium were in the decreasing order of 0.53, 0.18, and 0.064 g/sq m/mo, respectively, following the particulate Pb. Thee deposition rate of particulate Pb, Zn, Cu, and Cd decreases with increasing distance from the stack.

60560 **APTIC NO. 40896**

Renzanigo, F.

AIR POLLUTION IN THE CITY OF MILAN. OBSERVATIONS ON AN INVESTIGATION CARRIED OUT BETWEEN OCT. 1969 AND JUNE 1970 AND OCT. 1970 AND MAY 1971. *(L inquinamento atmosferico della citta di Milano. Osservazioni su un indagine svolta nel periodo ottobre 1969 - Giugno e Ottobre 1970 - Maggio 1971). Text in Italian. Riv. Combust. (Milan), 26(1):22-35, Jan. 1972. 9 refs.*

The contribution of heating to the air pollution in the city of Milan was studied between Oct. and June 1969-1970 and Oct. and May 1970-1971 and related to the local meteorology and to the utilized fuel. Milan is a city characterized by large levels of atmospheric humidity and very scarse winds, reaching a maximum of six km/hr speeds. Domestic heating represents one of the main pollution sources in Milan, utilizing fuel oils with a 2.8% sulfur content or solid fuels such as coal, coke, and anthracite with a level of volatile compounds below 13%. Other pollutant sources contributing to the atmospheric quality of the city are metallurgical industries, emitting metal oxides, lead and zinc compounds, sulfur dioxide, and chlorine and fluorine compounds; petroleum processing emitting sulfur compounds, hydrocarbons, and particles; rubber processing industries, emitting sulfur and nitrogen oxides, and carbon monoxide. The program for air quality studies herein described includes the installation of five monitoring stations in different areas of the city. The facilities operate continuously for 8 days at a time, taking samples twice a day for 6 hr periods from 6 through 12 am and from 3 through 9 pm. Analytical determinations include gravimetric dust measurement, and their qualitative and quantitative composition study by means of X-ray fluorescence spectrometry, atomic absorption, and neutron activation techniques and total acidity expressed in SO_2 and measured according to a British standard method. The variation in these two parameters related to temperatures and relative humidity if represented graphically. Peak values are usually reached during the December and January months, which coincide with the most persistent thermal inverstion seasons and decrease gradually from February through May. Cessation of heating leads to decreases in atmospheric SO2 from 0.54 ppm (Dec. 1969) to 0.02 ppm (June 1970. Dust decreases represent minor contrasts indicating the involvement of other important sources)automotive traffic, industries. The severe air pollution conditions during the winter season are attributed to the fuel factor and may be improved once the law regarding this subject is put into practice.

60561 APTIC NO. 48504

Tatsukawa Ryo, Tadaaki Wakimoto, and Isao Watanabe

AIR POLLUTION BY PCB. (I). *(PCB ni yoru taiki osen (I)). Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 111. (Nov. 7-9, Paper 66.)*

A simple and efficient adsorption measuring method was devised for polychlorinated biphenyl (PCB) pollution in the atmosphere. Out of doors, it is possible to measure PCB concentrations ranging from 0.5 mg/cu m to 1/1,000,000 or 0.003 micrograms (cu m of solid, 5 g by 2, 48 hr of suction, 20 cu m of ventilation). The sampler is connected with a suction pump and the air is sampled for a given period of time. Sampling in rain is possible. The efficiency is close to 100% when the sampler is operated for 48 consecutive hours, and no part of the PCB is lost. The PCB is concentrated and measured by column chromatography. Measurements were taken between April and June 1972 in various cities. Compared to rural cities such as Matsuyama, pollution by PCB in industrial areas and large cities like Tokyo and Osaka was extremely high. The atmospheric PCB concentration fluctuated very much with the weather. Analyses of plants and soil which reflect the past pollution condition will be helpful in further investigation of pollution patterns.

60562 APTIC NO. 47898

Watanabe, Hiroshi, Kokei Takata, Tahachiro Koyama, Hiroshi Kosaka, Masatoshi Nakamura, and Takatoshi Hiraki

INVESTIGATION ON PHOTOCHEMICAL OXIDANTS. (REPORT 1) ACID MIST IN URBAN ATMOSPHERE. *(Kokagaku okishidanto ni kansuru kenkyu (Daiippo) taikichu ni okeru san misuto ni tsuite). Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 67. (Nov. 7-9, Paper 15.)*

To examine the relationship between oxidant and aerosol, especially acid mist, field tests were conducted at three locations adjacent to the Osaka-Kobe industrial belt. Membrane filters with a 0.3-micron pore size were used for sampling aerosols at approximately 20 l/min, for 8 hours during the day and 16 hours at night. The time passage and the change in the concentration patterns by particle counts were examined using a cascade impacter and the metal membrane analysis method. Little reaction was noted to the changes of oxidant concentration, but the acid mist concentration by particle counts sometimes drastically increased when oxidant concentration was high. The time fluctuations of sulfate ion and nitrate ion, metal concentration, and particle size distribution of sulfate and nitrate were examined by the Andersen sampler. The high-volume sampler measurements showed no increase of ions occurring with the increase of oxidant; the figures agreed with the time fluctuation of suspended particulate concentration.

60563 APTIC NO. 50100

Kanagawa Prefecture Center for Public Nuisance Control (Japan) and Kanagawa Prefecture Pharmaceutical Assoc. (Japan)

SUMMARY OF AN AIR POLLUTION SURVEY IN KANAGAWA PREFECTURE FOR THE PAST THREE YEARS MADE BY THE ALKALINE FILTER PAPER METHOD. *(Kako 3-nenkan ni okeru arukari roshiho no yoru kanagawa-kenka no taiki osen chosa no matome). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokuku (Bull. Ind. Res. Inst. Kanagawa Prefecture), no. 14:21-32, Feb. 1972.*

Nitrogen oxides, sulfur oxides, and chlorine were measured at various cities in Kanagawa Prefecture in 1970 as part of a program begun in 1963. Monthly data is tabulated for commercial/residential, semi-industrial, and industrial areas. The yearly averages were 0.54 mg/day/100 sq cm for sulfur trioxide, 0.059 for nitrogen dioxide, and 0.022 for chlorine in Yokohama, and 0.72, 0.077, and 0.028, respectively for Kawasaki. The yearly averages for 1968, 1969, and 1970 were compared; the highest SOx value was recorded in 1969, the lowest SOx in 1970, the highest NOx in 1969, and the lowest Cl in 1970. There was a high correlation between SOx annd NOx and no correlation between Cl and SOx or NOx.

1971

60564 APTIC NO. 43066

Bourelly, T.

ATMOSPHERIC POLLUTION AROUND A PETROLEUM REFINERY: SECOND MEASUREMENT CAMPAIGN (SEPTEMBER 1, 1969-AUGUST 31, 1970). *(La pollution atmospherique autour d une raffinerie de petrole: Deuxieme campagne de mesures (ler septembre 1969-31 aout 1970)). Text in French. Cahiers Centre Sci. Tech. Batiment, no. 117, 8p., 1971 (?).*

The second series of atmospheric pollution measurements around the Vernon oil refinery, France, took place after the plant started operation. A comparison of the mean annual pollution between the year under study and the year before, when the plant was not yet in operation shows a decrease of 39% for black smoke and 29% for strong acidity. The general decrease for the Parisian Basin is brought about by meteorological phenomena. The effect of pollutants emitted by the refinery on the Vernon area was not detected. Under current climatic conditions, the pollution variations in the Vernon area are not dependent on the refinery operation. (Author abstract modified)

60565 APTIC NO. 42406

Horiuchi, Kazuya and Toru Fujii

AIR POLLUTION IN JAPAN IN THE PRESENT TIME. *(Osaka-fu Kogai Kanshi Senta Chosa-Shitsu Kenkyu Kokoku) (Proc. Res. Sect. Osaka Environ. Pollution Control Center), no. 2:27-48, Dec. 1971.*

The air pollution problem in Japan has been aggravated by an increased consumption of fuels and an increased population of automobiles. The pollution of the ambient air has been an important social problem in industrial urban areas with large populations. The sources, severity, measurement methods, and health effects of sulfur oxides, carbon monoxide, nitrogen oxides, particulate matters, dusts, hydrocarbons, and oxidants are described. The yearly variation of dust fall and sulfur oxides in the main cities in Japan is presented. Among the metal components of particulate matter, iron, manganese, copper, and nickel constitute a fairly large percentage. Yearly average concentrations of CO range within 3.0-6.7 ppm; nitric oxide and nitrogen dioxide concentrations are within 0.02-0.06 ppm. Diurnal variation of SOx, NO, NO2, CO, and oxidants in Osaka City are presented by month. Hourly variations of atmospheric aliphatic hydrocarbons by their compounds and concentration of aromatic hydrocarbons in downtown Osaka City are also shown. Studies on the relation between the prevalence rate of chronic bronchitis and the pollutants, especially SO2, in ambient air in Osaka Prefecture revealed a significant statistical correlation. Ambient air standards for SOx are presented.

60566 **APTIC NO. 41319**

Hoshikawa, Hidehiko, Toshihiko Seki, Morio Suzuki, Koshi Abe, and Tadashi Sugano

INVESTIGATION ON AIR POLLUTION. THE FOURTH REPORT. THE AMOUNT OF DUST FALL AND SULFUR OXIDES IN SENDAI CITY DURING THE LAST FOUR YEARS (1966-1969). *(Taikiosen ni kansuru chosakenkyu. Dai 4 Ho. Sendai shinai ni okeru kako 4 nenkan (Showa 41 nen - 44 nen) no Kokabaijin oyobi Iousankabutsu ryo ni tsuite)). Text in Japanese. Sendai-shi Eisei Kenkyusho Ho (Proc. Inst. Pub. Health, Sendai City), no. 2:97-111, 1971.*

The average annual dust fall of all areas in Sendai was 8.04 tons in 1966, 6.95 tons in 1967, 6.80 tons in 1968, and 6.50 tons in 1969, showing a slight decline. The value in 1969 was about a 20% decrease compared with that in 1966. The tendency to decrease is shown in three spots which recorded over 10 tons in 1966, 9.83 tons, and 1.66 tons for the lowest in 1969. High values were observed in December and January to April and low values were observed in July to October throughout the last four years. The value in spring was 1.7 times higher than in autumn. This decrease was due to the conversion of fuel to oil in factories. The average annual sulfur oxide concentration was 0.36 mg in 1967, 0.35 mg in 1968, and 0.36 mg sulfur trioxide/100 sq cm/day in 1966, 0.33 in 1967, 0.35 mg in 1968, and 0.36 mg in 1969, showing no marked fluctuation. The cow shed block area showed an increase to 0.78 mg in 1969, twice higher than a mean value of all regions. High values were observed during an air-conditioned period in the summer (about twice non-air conditioned seasons). The most polluted months were December and January to March when the value of the cow shed block area was over 1.0 mg. The increase was due to the development of utilization of fuel heavy oil in factories and air conditioning in buildings.

60567 **APTIC NO. 35715**

Just, Jan and Jadwiga Kelus

CADMIUM IN ATMOSPHERIC AIR OF 10 SELECTED TOWNS IN POLAND. *(Kadm w powietrzu atmosferycznym 10 wybranych miast w Polsce). Text in Polish. Roczniki Panstwowego Zakladu Higi., 22(3):249- 256, 1971. 18 refs.*

The first attempt to determine the content of cadmium in the dust suspended in atmospheric air in Poland is discussed. The tests showed a relatively low cadmium concentration (ranging from 0.002% to 0.018%) and little variation during the year. Only in Katowice was the concentration of cadmium (0.051 micrograms/cu m) close to that found in Chicago, a city with the highest level recorded in the United States. Lowest concentrations occurred in Gdansk (0.002 microgram/cu m). These findings show no immediate health hazard.

60568 **APTIC NO. 40506**

Kitamura, Yoshihiko and Hidemi Kurita

INVESTIGATION OF AIR POLLUTION IN MAGANO PREFECTURE. PART 3. DUST FALL IN NAGANO PREFECTURE. *(Nagano-ken no taikiosen chosa dai 3-po. Nagano-ken no kokabaijin (Showa 45-nen)). Text in Japanese. Nagano-ken Eisei Kogai Kenkyusho Chosa Kenkyu Hokoku (Bull. Nagano Prefect. Inst. Public Health Public Nuisance), no. 95:1-59, July 1971.*

Measurement of dust fall in Nagano Prefecture in 1970 was carried out at 20 points which were the same as in the previous year and at three new points. The average height of the measuring point was 11.9 m, which was slightly higher than that of the previous year. The result was shown in a logarithmic table. The average amount of dust fall/year at different points was 3.94 g/sq m/30 days, which decreased 30% compared with the value of the previous year. All components except sulfate decreased from 1967. The same relationship between soluble ignition loss, soluble solid ash, calcuim sulfate, and respiration as in the previous year were obtained, but the relationship between the amount of dust fall and the insoluble portion was not cleared.

60569 **APTIC NO. 73415**

Kurita, H., M. Maruyama, and A. Miyajima

AIR POLLUTION SURVEY IN NAGANO PREFECTURE (REPORT NO. 2) FOR 1969. *(Nagano-ken no taiki osen chosa, (Dai-2-ho), Showa 44-nen). Text in Japanese. Chosa Kenkyu Hokoku, Nagano-ken Eisei Kogai Kenkyusho (Rept. Res. Surv., Nagano Prefect., Inst. Public Health, Japan), no. 93:1-54, July 1971. 1 ref.*

Data has been compiled for precipitated particulates in Nagano Prefecture, Japan, in 1969. There were 23 monitoring stations, measuring precipitation at an average height of 10.5 m above the ground. The total average amount of precipitated particulates was 5.56 g/sq m/30 days, not much different from 1967 and 1968 values. Precipitation was analyzed for pH, insoluble components (tar, loss on ignition, and ash), and double components (loss on ignition, ash, sulfate, chloride, and calcium ions). The distribution of pH followed a regular logarithmic distribution. The amount of soluble components increased when the amount of liquid precipitation increased. The amount of insoluble components decreased as distances above the ground increased. These tendencies follow tendencies found in 1968.

60570 **APTIC NO. 43010**

Lieberman, A., P. Melnychuk, and H. M. Ogle

COMPARISON OF CONTINUOUS MEASUREMENT OF INTERIOR AND EXTERIOR AEROSOL LEVELS. *Preprint, American Industrial Hygiene Assoc., Detroit, Mich., 16p., 1971. 5 refs. (Presented at the American Industrial Hygiene Association Conference, Toronto, Ontario, May 24-28, 1971.)*

The relative concentrations of aerosol particles inside and outside a typical light manufacturing plant were examined. The plant was a single-story building of 30,000 sq ft. The building was equipped with a unified heating, filtering, and air conditioning system providing eight air changes/hr. Approximately 80% of the air entering the blowers came from return ducts from various parts of the building. Twenty percent of the air was outside air make-up The interior air sample was taken in a room with very light traffic by an instrument placed on a bench 48 in. above floor level. Outside air was sampled at a point approximately five ft above the rooftop. Measurements were carried out on a 24-hour basis with chart recording at intervals of approximately two sec. Variations in number concentrations of particles larger than 0.5 micron were similar for interior and exterior air. Concentrations were generally but not always higher in the outside air. Indoor particle concentrations varied with meteorological conditions. The ratio of particulate concentration of outside to inside air was about two to one for outside concentrations greater than 100,000 particles/cu ft. For outside concentrations much less than 100,000 particles/cu ft, the ratios decreased, indicating that the effect of particle generation in the building was becoming more important.

60571 **APTIC NO. 81942**

Nakamura, Kinji and Toshio Ohira

CONSIDERATIONS CONCERNING THE CARBON MONOXIDE CONCENTRATIONS IN THE VICINITY OF INTERSECTIOS. *(Kosaten shuhen no issanka tanso nodo ni tsuite no kosatsu). Tokyo-to Kogai Kenkyusho nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 2:39-43, 1971. Translated from Japanese. Leo Kanner Assoc., Redwood City, Calif., 20p., Sept. 1974.*

NTIS: PB 237790-T

Daytime carbon monoxide concentrations in the vicinity of seven different intersections were measured. Meteorological conditions were not taken into account. Carbon monoxide concentrations in the vicinity of the intersections were not uniform, necessitating the use of more than one measurement location for each intersection. The deviations from representative CO values ranged from 1.86-5.02 ppm for one measuring location in contrast to 0.61-1.68 ppm for three measuring locations. The mean CO concentration at four corners of an intersection showed a good correlation with CO values in the vicinity of the intersecting roads. No consistent relationship between automobile traffic and CO concentration was observed, possibly due to meteorological conditions and the narrow range of daytime traffic fluctuation. Carbon monoxide pollution from automobile exhaust was very localized, with CO concentrations at places more than 50 m from the source dropping to less than half of the concentration at the intersection.

60572 APTIC NO. 47788

Ose, Youki, Taira Ikedo, Youko Tanak, and Hayaki Niwa

STUDIES ON PUBLIC NUISANCE CAUSED BY AIR POLLUTION (III). AIR POLLUTION IN GIFU CITY. *(Taiki osen ni motozuku kogai ni kansuru kenkyu (Daisanpo) Gifu-shi no taiki osen). Text in Japanese. Gifu Yakka Daigaku Kiyo (Ann. Proc. Gifu Coll. Pharm.), no. 20:9-16, 1971. 9 refs.*

The filter paper method was utilized to monitor air pollution in Gifu City, Japan, from 1963 to 1965; sulfur oxides and oxides of nitrogen levels were determined at eight different locations. Sulfur trioxide values ranged between 0.01 and 0.71 mg/100 sq cm/day with a mean value of 0.31 mg/100 sq cm/day. Nitrogen dioxide values ranged between 0.017 and 0.192 mg/100 sq cm/day with a mean value of 0.063 mg/sq cm/day. Smog conditions were measured in Gifu City on the 10th and 15th of June, 1963. On the 10th, more than 0.2 ppm sulfur dioxide was measured, while SO2 levels were low and carbon dioxide levels were high on the 15th. Since the latter condition was caused by burning wheat straw, it has been called Rural Type Smog. Calm weather conditions preceded these smog episodes.

60573 APTIC NO. 45619

Sedlacek, William A., George A. Cowan, Thomas G. Gregory, Jr., Paul R. Guthals, and Helen L. Smith

CHARACTERIZATION AND TRACKING OF AEROSOL SOURCES WITH THE USE OF AIRCRAFT SAMPLING. *Preprint, American Chemical Society, Washington, D. C., 34p., 1971. (Presented at the American Chemical Society, National Meeting, 161st, Los Angeles, Calif., March 28 - April 2, 1971.)*

Particulate emissions from a power plant, sawmill waste burners, copper smelters, carbon black plants, gypsum and perlite plants and mines, a potash mine, iron smelters, an oil refinery, forest fires, a chemical plant, and a zinc smelter and the particulate contents of the air in several urban centers were sampled on a wing tip sampler-filter during aircraft flights. The collected particulates were analyzed by instrumental neutron activation analysis and scanning electron microscopy to determine aerosol concentrations and components, morphological characteristics, particle size distributions, and elemental compositions. Sampling techniques, analytical procedures, and survey results are reviewed. The pollutants determined in the samples included sodium, magnesium, aluminum, sulfur, chlorine, calcium, titanium, vanadium, manganese, molybdenum, tin, iodine, barium, potassium, chromium, iron, cobalt, zinc, arsenic, selenium, bromine, silver, cerium, and cesium.

60574 APTIC NO. 40623

Office of Air Programs, Research Triangle Park, N. C., Div. of Atmospheric Surveillance

AIR QUALITY DATA FOR 1967. FROM THE NATIONAL AIR SURVEILLANCE NETWORKS. *Pub-APTD 0741, 193p., Aug. 1971. 1 ref.*

NTIS: PB 203546

A national summary of pollutant levels for 1967 shows that particulates totaled 28.6 million tons carbon monoxide, 01.6 million t; hydrocarbons, 31.5 million t; oxides of nitrogen, 16.7 million t; and oxides of sulfur 31.2 million t. Particulates are also averaged by population class and annual averages for each of the six Continuous Air Monitoring Program stations over the period 1962-67 are presented for gaseous pollutants. Monthly and daily data are given. The variety of classes of pollutants measured and presented include urban and nonurban values for suspended particulates, benzene soluble organic constituents, nonmetallic inorganic constituents, metals, and gaseous pollutants. Emission estimates have been included for forest fires, burning coal refuse, and an increased number of industrial process sources. The rate of emission for sulfur oxides is expected to remain unchanged as increased fuel consumption is offset by conversion to low sulfur fuels. Soiling index data are also given. (Author summary modified)

60575 APTIC NO. 40736

Aichi Prefectural Government (Japan)

ANNUAL REPORT ON CONDITIONS OF PUBLIC NUISANCE - A WHITE PAPER ON PUBLIC NUISANCE, 1970. *(Kogai no jokyo ni kansuru nenji hokoku-- kogai hakusho. Showa 45-nendo). Text in Japanese. 1971. 204p.*

Aichi Prefecture has been monitoring sulfur dioxide concentrations in the atmosphere in the Nagoya industrial area by the lead dioxide method since 1963, and by the electroconductivity method since 1968. At present, measurements are taken at 43 locations. The annual total average for 1965 taken by the lead dioxide method was 0.89 mg/100 sq m/day; it increased to 1.26 mg in 1968. But the figures for 1969 (1.24 mg) and 1970 (0.97 mg) show a tendency to decrease. Seasonal variances in the greater Nagoya area are extreme, averages of winter months (Dec. to March) run as much as 5.7 times that in Tokai and 4.5 times that in Kariya over the figures of the summer season. Measurements for settling particles have stayed approximately the same since 1970. The total monthly average for 1970 was 7.1 ton/sq km. However, within the area, averages range from 12.4 tons in Tokai to 6.5 tons in other areas. Nagoya city has been measuring automotive emission components such as carbon monoxide, nitric oxide, and nitrogen dioxide since 1968. The maximum CO concentration for 1970 (8-hour average) was 15.4 ppm, and the maximum 24-hour average was 9.5 ppm. These figures were within the environmental standards. In Kariya, the highest single measurement was 2 ppm, and the 24-hour average was 5.4 ppm. The highest NO2 hour-average was 0.122 ppm in Tokai, and some other areas of Greater Nagoya showed temporary high figures. Suspended particulates were measured in five cities and three townships of the Greater Nagoya area. The measurements were all within the standards. The first case of photochemical smog occurred in the area in July 1970 for three consecutive days. the maximum oxidant concentration was 0.165 ppm at noon, July 29. A total of 277 persons were affected by the smog.

1970

60576 APTIC NO. 43025

Lee, Robert E., Jr., Stephen S. Goranson, Richard E. Enrione, and George B. Morgan

THE NASN CASCADE IMPACTOR NETWORK. PART II. SIZE DISTRIBUTION MEASUREMENTS OF TRACE-METAL COMPONENTS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 10p., 1970. 9 refs.*

The National Air Surveillance cascade impactor network operated in Chicago, Cincinnati, Denver, Philadelphia, St. Louis, and Washington, D. C., during 1970 with 24-hr samples collected biweekly. The size distribution, based on the aerodynamic dimension of the particles of total suspended particulate matter was determined gravimetrically. Samples were also chemically extracted and analyzed with an emission spectrograph to obtain information on the metal concentration in each size fraction. Particle-size data on a quarterly and an annual basis for each city are reported for lead, iron, copper,

zinc, manganese, nickel, and vanadium; less complete data on cadmium, tin, barium, samarium, and molybdenum are also given. The relationship of the metal concentration to the particle size of total suspended particulate matter was determined for these metals. For particles less than or equal to 3 micron in diameter, iron was in the highest concentration (3-5%), followed closely by lead (1-2%). However, for suspended particulate matter less than or equal to 0.5 micron in diameter, lead was highest (2-4%), whereas iron and other measured components were markedly lower in concentration (less than 1%). Metal concentration as a function of particle size is discussed. (Author abstract modified)

60577 APTIC NO. 24635

Shenfield, L. and F. Frantisak

ONTARIO S AIR POLLUTION INDEX. *Water Pollut. Contr., 108(11): 55-58, Nov. 1970. 15 refs.*

Day-to-day pollution levels in Ontario are obtained by using an Air Pollution Index that provides a basis for action in an alert system to control or prevent an air pollution episode. Because photochemically produced smog is not as important in the province as the reducing type smog, the Index is based only on concentrations of sulfur dioxide and particulates. Sulfur dioxide is measured directly by continuous analyzers, with measurements telemetered from field stations to a central office. The present technique for measuring particulates involves the use of the Hemeon paper tape sampler and a high-volume sampler. The latter method provides concentrations in micrograms/cu m units; the data cannot be telemetered on a real time basis. The Hemeon paper tape sampler can be set to provide hourly readings which can be telemetered. Differences in transmittance of light through soiled and clean portions of the filter paper tape are converted into units of the coefficient of haze (COH). The 24-hr COH and sulfur dioxide levels set by Ontario regulations as objectives are 1.0 and .10 ppm, respectively. For these levels, an Air Pollution Index of 32 provides a range of indices twice as great for control action to take place than the range of acceptable levels, 0 to 32.

60578 APTIC NO. 38286

National Inst. of Hygienic Sciences, Tokyo (Japan) and
Ministry of Health and Welfare (Japan), Dept. of
Environmental Pollution Control

OUTLINE OF THE RESULT OF ESTIMATION DONE BY AIR POLLUTION MEASURING NETWORK IN TOKYO. *(Tokyo-tonai 3 kasho no taikiosen sokuteimou sokutei kekka no gaiyo). Text in Japanese. 62p., 1970.*

From Jan. to Dec. 1970, at Kasumigaseki, Itabashi, and Shinjuku (from May to Sept. this was changed to Ohara-cho because of the road construction), sulfur oxides, floating dust, carbon monoxide, nitrogen oxides, formaldehyde, and hydrocarbons were measured by an automatic recorder. At Kasumigaseki the amount of traffic was estimated at the same time. The annual average value of carbon monoxide at three sites was 5.0 ppm, which decrease by 1.4 ppm compared with 1969. The number of days which did not fit the conditions of environmental standards was rather few, compared to the survey of the previous year. On the other hand, the annual average values at these three sites were 12.7 pphm in nitric oxide and 5.4 pphm in nitrogen dioxide, an increase of 3.5 pphm and 0.6 pphm respectively compared with the previous year. Sulfur oxides were 5.3 pphm, showing an 0.4 pphm decreased compared to the preious year, at Kasumigaseki and Itabashi, this exceeded the environmental standards, and at Ohara-cho, it was below the standards. The daily average value was below 0.05 ppm, indicating 64.2%, which exceeded the standard value (70%). The average hourly values of floating dust at Kasumigaseki, Itabashi, and Ohara-cho were 177, 224, and 151 micrograms/cu m respectively, showing the decrease compared to the previous year. Formaldehydes and hydrocarbons were estimated only at Kasumigaseki; thee annual average value of the former was 0.70 pphm, and the latter was 1.19 ppm. The ratio of unsaturated hydrocarbons against total hydrocarbons was 1/3. Detailed values were indicated in figures or tables.

60579 APTIC NO. 42094

Shizuoka Prefecture (Japan), Public Nuisance Section and
Ministry of Health and Welfare (Japan)

REPORT ON INVESTIGATIONS OF ENVIRONMENTAL AIR IN FUJI DISTRICT. JAN. 1970. *(Fuji-chiku kankyo taiki chosa hokokusho). Text in Japanese. 164p., Jan. 1970.*

General meteorological observations on the ground (wind direction and velocity at 6 spots; temperature, humidity, and amounts of isolation at one spot), special meteorolgical observations (vertical distributions of temperature, wind direction and velocity, and variations of air current at one spot), density of sulfur oxides (at 20 spots), amounts of suspended particulate matter (at 5 spots), and component analyses, were performed in Fuji district (Fujinomiya City, Fuji City, Shibakawa-cho, Fujigawa-cho and Kamahara-cho) January 23-27, 1970. Results of measurements are recorded and summarized. The results of density measurements of SOx by the para-rosaniline method were indicated by day and hour. Amounts of suspended particulate matter were made by fluorospectrometry concerning organic substances, water-soluble substances (pH, sulfates, nitrites) and metal ingredients (beryllium, iron, lead, chromium, manganese, vanadium, nickel, copper, zinc, and cobalt). The results of density measurements were given by day and hour. The vertical distributions of temperature, wind direction an velocity, and the variation of air current were measured by means of kytoons, sondes for lower air, and pilot balloons. Main factory locations in this area, soot and smoke producing equipment, and fuel use are described. Sulfur oxide values measured by the lead dioxide method and an automatic recorder in Fuji City, Fujinomiya City, Fujigawa-cho, Kamahara-cho and Yui-cho from Jan. to Dec. 1969.

1969

60580 APTIC NO. 42481

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE, SULFUR DIOXIDE AND DUST CONCENTRATIONS AT THE ENGELBREKTSPLAN, STOCKHOLM, FROM JAN. 15 THROUGH FEB. 10, 1969. *(Matning av koloxid-, svaveldioxid- och stofthalten vid Engelbrektsplan, Stockholm under tiden 15.1. - 10.2.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-36, 16p., June 5, 1969.*

Results of carbon monoxide, sulfur dioxide, and dust concentration measurements, carried out at the Engelbrektsplan, Stockholm, are presented. The dust and SO2 measurements covered 59.3% and 70.9% of the total test period, respectively. The CO concentrations were largely the same as during the last Sept.-Oct. 1968 test period. The cumulative frequency of 7.6 and 13.5 ppm was 50 and 75 percentile, respectively, and a maximum 30-min mean of 42.4 ppm between 5 pm and 5.29 pm was measured. The dust concentrations were about 1.5 times higher than during the previous Sept.-Oct. 1968 test period. A maximum hourly average of 0.86 mg/cu m was measured, and 50- and 75-percentile cumulative frequency for 0.140 and 0.225 mg/cu m was determined. The SO2 concentrations were about twice those measured during the previous period. The 50- and 75-percentile cumulative frequencies pertained to 5.9 and 7.6 ppb.

60581 APTIC NO. 42484

Dolling, B. and N. Walde

MEASURAMENTS OF THE CARBON MONOXIDE, SULFUR DIOXIDE AND DUST CONCENTRATIONS AT THE INTERSECTION OF FRIDHEMSGATAN AND KUNGSHOLMSGATAN (STREETS) IN STOCKHOLM FROM MARCH 3 THROUGH 25, 1969. *(Matning av* *koloxid-, svaveldioxid- och stofthalten i hornet Fridhemsgatan r Kungsholmsgatan, Stockholm, under tiden 3 - 25.3.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-40, 15p., Aug. 19, 1969.*

Results of carbon monoxide, sulfur dioxide, and dust concentration measurements, carried out at the intersection of Fridhemsgatan and Kungsholmsgatan, Stockholm are presented. The CO concentrations, showing daily minima and maxima of 4.2 and 10.0 ppm, were largely the same as during the last Nov.-Dec. test period. The highest 30-min mean (23.2 ppm) was measured between 4.30 pm and 4.59 pm. Cumulative frequencies of 50, 75, and 99 percentile for 6.6, 8.9, and 17.0 ppm, respectively, were determined. The dust concentrations, very high due to thawing, were two to three times higher than during the last test period. The highest hourly average of 1.46 mg/cu m was measured between 5.30 pm and 5.29 pm, while the daily minima and maxima were 0.12 and 0.72 mg/cu m. The cumulative frequencies of 50, 75, and 99 percentile pertained to 0.32, 0.57, and 1.25 mg/cu m concentrations, respectively. The SO2 concentrations, the daily minimum and maximum of which were 2.8 and 8.5 ppb, had a highest 30-min mean of 20.0 ppb between 10.00 am and 10.30 am. Cumulative frequencies of 50, 75, and 99 percentile for 5.0 7.5 and 15.9 ppb were determined.

60582 **APTIC NO. 42487**

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE, SULFUR DIOXIDE AND DUST CONCENTRATIONS AT THE ENGELBREKTSPLAN IN STOCKHOLM FROM APRIL 15 THROUGH MAY 6, 1969. *(Matning av koloxid-, svaveldioxid- och stofthalten vid Engelbrektsplan, Stockholm, under tiden 15.4. - 6.5.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. TPM-BIL-43, 15p., Sept. 5, 1969.*

Results of carbon monoxide, sulfur dioxide, and dust concentration measurements, carried out at the Engelbrektsplan in Stockholm, are presented. The SO2 measurements covered 82.5% of the total test period. The CO concentrations lay in the same order of magnitude as during the Sept.-Oct. 1968 test period, and were about 3 ppm lower than during the last Jan.-Feb. 1969 test period. Cumulative frequencies of 50 and 75 percentile for 5.9 and 9.1 ppm were determined, while the highest 30-min mean, measured between 4.30 pm and 4.39 pm, was 40.1 ppm. The dust concentrations were slightly above the last winter values, and about 1.8 times higher than during the Sept.-Oct. 1968 period. The extrema were lower than during the last winter measurements. Cumulative frequencies of 50 and 75 percentile for 0.172 and 0.255 mg/cu m were determined, and the highest hourly average, measured between 4 pm and 4.59 pm, was 0.76 mg/cu m. The SO2 concentrations, accounting for about 50% of the values obtained during the last winter measurements, were largely the same as during the Sept.-Oct. 1968 period. The 50- and 75- percentile cumulative frequencies pertained to 3.0 and 3.6 ppb, and a maximum 30-min mean of 11.4 ppb was measured between 6 am and 6.29 am.

60583 **APTIC NO. 42499**

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE, SULFUR DIOXIDE AND DUST CONCENTRATIONS AT GOTGATAN 76 (76 GOT STREET) (SKATTEHUSET-TAX OFFICE BUILDING) IN STOCKHOLM FROM FEB. 10 THROUGH MARCH 1, 1969. *(Matning av koloxid-, svaveldioxid- och stofthalten vid Gotgatan 76 (Skattehuset), Stockholm, under tiden 10.2 - 1.3.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-45, 15p., Sept. 19, 1969.*

Results of carbon monoxide, sulfur dioxide and dust concentration measurements, carried out at Gotgatan 76 in Stockholm are presented. The SO2-recording covered 90.2% of the total test period. The CO concentrations were decidedly lower than those obtained during the last Oct.-Nov. 1968 test period. The latter were about 1.6 times higher than the values obtained during the present period. Cumulative frequencies of 50 and 75 percentile for 3.0 and 4.7 ppm were determined, and a maximum 30-min mean of 19.5 ppm during morning hours was measured. The dust concentrations exceeded the corresponding values obtained during the previous test period by about 1.7 times. Cumulative frequencies of 50 and 75 percentile for 0.213 and 0.300 mg/cu m were determined. A maximum daily average SO2 concentration of 14 ppb on the coldest day of the total test period, with an inversion in the 127-312 m-layer and very low wind speed, was measured. The 50- and 75-percentile cumulative frequencies pertained to 6.3 and 9.5 ppb, respectively.

60584 **APTIC NO. 42500**

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE, SULFUR DIOXIDE AND DUST CONCENTRATIONS AT GOTGATAN 76 (76 GOT STREET) (SKATTEHUSET-TAX OFFICE BUILDING) IN STOCKHOLM FROM MAY 6 THROUGH MAY 27, 1969. *(Matning av koloxid-, svaveldioxid- och stofthalten vid Gotgatan 76 (Skattehuset), Stockholm, under tiden 6.5 - 27.5.1969). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-46, 15p., Sept. 22, 1969.*

Results of carbon monoxide, sulfur dioxide and dust concentration measurements, carried out at Gotgatan 76 in Stockholm are presented. The SO2 recordings covered 67.8% of the total test period. The CO concentrations were slightly higher than in the Oct. 25 - Nov. 25, 1968 period. The 50 and 75 percentile limits (7.0 and 9.9 ppm, respectively) were about 1.4 times higher than in the previous period, while the maxima were largely identical. The concentrations were nearly twice those measured during the last February test period. A maximum 30-min mean of 38.0 ppm for late afternoon hours was obtained. The dust concentrations were largely the same as during the last February-March test period, but the distribution of low and medium values was different. The 50- and 75-percentile cumulative frequencies pertained to values of 0.225 and 0.347 mg/cu m, and a maximum hourly mean of 0.76 mg/cu m during morning hours was measured. The cumulative frequencies of 1.1 and 1.7 ppb SO2 concentrations were 50 and 75 percentile, respectively.

60585 **APTIC NO. 42501**

Walde, N.

ORGANIC LEAD COMPOUNDS IN THE AIR AS RELATED TO OTHER AIR POLLUTANTS. *(Alkylbly i luft i forhallande till andra luftfororeingar). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-47, 6p., Oct. 3, 1969.*

Results of two simultaneous organic lead, carbon monoxide, and dust concentration measurements in Stockholm are presented. The 30-min means of the organic lead contents, obtained at four different points, lay in the respective ranges of 0.8-1.0, 0.68-1.3, 0.15-2.00, and 0.04-0.20 micrograms/cu m. The inorganic lead contents, estimated from the measured CO and dust contents, and obtained from the dust analyses, were of the same order of magnitude. The estimated total lead to organic lead ratio ranged from one to 10%, the latter value being related to the cold season. The organic lead (in micrograms/cu m) to CO (in ppm) ratio was the range of 0.0097-0.174. Seasonal variation in the relationship between CO and organic lead concentrations may be possible due to increased lead emissions from cold engines and to the sensitivity of organic lead compounds to sunlight.

60586 **APTIC NO. 36963**

Woodard, Franklin E., Otis, J. Sproul, Erwin B. Douglass, and Millard W. Hall

A STATEWIDE STUDY OF AIR QUALITY PROBLEMS. *Rhode Island Univ., Kingston, Proc. North Eastern Re-*

gional Antipollution Conf., Kingston, R. I., 1969, p. 97-101. 2 refs. (July 22-25.)

Air quality problems, contributing factors, and corrective measures for the state of Maine were studied. Results of the field sampling programs, survey of pollution sources, and legislation study are presented. Measurement data on suspended particulates, sulfur dioxide, nitrogen dioxide, nitric oxide, hydrogen sulfide, methyl mercaptan, and carbon monoxide were correlated with meteorological data. Major sources of pollution in Maine included gaseous emissions from polluted water, kraft pulp mills and food and feed processing plants. Financial requirements for the initial control program were estimated.

1968

60587 **APTIC NO. 42478**

Dolling, B. and N. Walde

MEASUREMENTS OF CARBON MONOXIDE AND DUST CONCENTRATIONS AT ARSENALSGATAN 8 D (8 D ARSENAL STREET), STOCKHOLM, FROM MAY 20 TO JUNE 14, 1968. *(Matning av koloxidoch stofthalten pa Arsenalsgatan 8 D, Stockholm, under tiden 20.5. - 14.6.1968). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-25, 14p., Nov. 18, 1968.*

Results of carbon monoxide and dust concentration measurements, carried out at Arsenalsgatan 8 D, Stockholm, are presented. The sampling was made 1.5 m above the sidewalk near the curb. The traffic was frequently stopped in both lanes. High temperatures and low wind speed were measured. Thirty-min, hourly, and daily means of the measured concentrations are given. The minimum and maximum values of the daily average CO concentrations were 1.18 and 11.71 ppm, while the respective values for dust were 0.06 and 0.21 mg/cu m. Cumulative frequency curves for CO and dust concentrations are given. The cumulative frequency for 5.0 ppm of CO and 0.120 mg of dust/cu m was 50 percentile. Both the CO and dust concentrations were lower on Sundays and holidays than on weekdays.

60588 **APTIC NO. 42480**

Dolling, B. and N. Walde

MEASUREMENTS OF THE CARBON MONOXIDE AND DUST CONCENTRATIONS AT KUNGSGATAN (STREET IN STOCKHOLM) NEAR REGERINGSGATSBRON (REGERINGSGATA BRIDGE) FROM AUG. 30 TO SEPT. 25, 1968. *(Matning av koloxid- och stofthalten pa Kungsgaten vid Regeringsgatsbron under tiden 30.8. - 25.9. 1968). Text in Swedish. Aktiebolaget Atomenergi (Sweden), Rept. BIL-27, 14p., Dec. 20, 1968.*

Results of carbon monoxide and dust concentration measurements, carried out at Kungsgatan near Regeringsgatsbron in Stockholm are presented, and compared to results of corresponding measurements in 1966. Thirty-min, hourly, and daily means of the measured concentrations are given. The CO-concentrations, receding rapidly after the evening rush hours, are compared to 1966 values on the basis of cumulative frequency curves for 30-min means. The 50 percentile limit in 1968 was 12.4 ppm against a value of 20.7 ppm in 1966. The 1966 values were about eight ppm higher than those obtained in 1968. The highest 30- min mean was 55.8 ppm as against a corresponding value of 56 ppm in 1966. Very high hourly means of the dust concentration during the morning hours (6 to 8 am) were measured on several days, which were followed by g CO-peaks. Maxima around one mg/cu m were measured. Cumulative frequency of dust concentrations was calculated.

60589 **APTIC NO. 47783**

Kanno, Saburo, Shozo Fukui, Shoji Naito, Mikihiro Kaneko, Setsuko Fushida, and Junzo Matsuzaki

ATMOSPHERIC ANALYSIS BY ALKALI FILTER PAPER. *(Arukari roshi-ho o mochiite sokutei shita Kanagawa-kenka no taiki osenso). Text in Japanese. Kanagawa-Ken Eisei Kenkyusho Nenpo (Annu. Rep. Kanagawa Prefect. Pub. Health Lab.), no. 18:98-101, 1968.*

Measurements made monthly from April 1968 to Feb. 1969 of atmospheric nitrogen dioxide, sulfur trioxide, and chloride, in 11 cities in Kanagawa Prefecture, Japan, showed that the concentrations are very high in industrial districts and tend to increase in the adjacent areas. Oxides of nitrogen levels are high in heavy traffic areas, and chloride concentrations are high by the sea. The highest concentrations are in Kawasaki which has 0.18 mg/cc/day of NO2 and 1.34 mg/cc/day of SO3.

1967

60590 **APTIC NO. 82180**

OPERATION CARBON MONOXIDE. *(Operation Oxyde de carbone). Text in French. Lab. Munic. Prefect. Police Paris no. 56.275 D/PA Part I:1-19, April 1967.*

The results obtained during the course of the Carbon Monoxide 1966 project show that the atmospheric pollution in Paris is slightly increased over the level reported for 1965, as monitored at 317 sites. As in previous years, there are certain Parisian sections where the inadequate circulation leads to a raised mean level of air pollution, even surpassing 40 ppm, the accepted upper limit of serious air pollution. These points include Place Mazas, with 60.1 ppm; Champs-Elysses Circle, with 50.7 ppm, the intersection of President Wilson Avenue and Avenue Marceau, with 50.0 ppm; the intersection of Rue de Bac and Quai Valtaire, with 49.2 ppm; and the intersection of Boulevard Saint-Martin and Rue Saint-Martin, with 49.7 ppm. Areas of high air pollution always occur in the center of Paris where the average level of atmospheric CO exceeds 26 ppm; the outlying parts of the city are generally less affected. The situation is slightly worse in underground tunnels than in previous years, not only with respect to mean, but also with respect to individual measurements: 72.4 ppm average in the Porte de Champerret and 84.1 ppm average in the Porte Maillot. Air pollution in automobile garages is also discussed. The small size of the increase in air pollution is attributed to the instituting of better traffic patterns. (Author abstract)

60591 **APTIC NO. 82272**

OPERATION LOOP OF THE SEINE. *(Operation Boucle de la Seine). Text in French. Lab. Munic., Prefect. Police Paris no. 56.275 D/PA Part IV:1-9, April 1967.*

The results of a study of air pollution near a suspected source, based on monthly dust fall measurements, show that this region is abnormally polluted by dusts. The level of 3,4-benzopyrene (BP) was considerable. The monthly levels of this carcinogen at seven stations in the vicinity of the suspected source were two to six times higher (3.2 to 25.2 mg/g dust) than at other stations in the loop of the Seine (2.1 mg/g dust). One station in particular yielded BP levels almost two to six times higher, 33.5 mg/g dust, than the levels recorded in these seven sites. The suspected pollution source, two thermal power plants which process coals and tars, is thus believed to be the source of the dusts rich in BP. (Author abstract)

1966

60592 **APTIC NO. 82314**

Fortak H.

MATHEMATICAL DETERMINATION OF THE BASIC SO2 LOAD FROM EMISSION DATA. APPLICATION TO CONDITIONS IN THE CITY OF BREMEN. *(Rechnerische Ermittlung der SO2-Grundbelastung aus Emissionsdaten. Anwendung auf die Verhaltnisse des Stadtgebietes von Bremen). Text in German. Berlin Free Univ., West Germany, Inst. for Theoretical Meteorology, 232p., Feb. 28, 1966. 8 refs.*

A model for the basic sulfur dioxide load of an industrial area is proposed, based on the principle that the SO2 load can be determined from the frequency of dispersion of the ground immission. Three indices are used to characterize the SO2 load: average, mean, and 97.5% limit of confidence for each site of high concentrations. The frequency distribution was determined after compilation of all sources of air pollution and subsequent correlation of this data with meteorological data. Gaussian distributions were obtained for SO2 emissions from various sources. The frequency distributions for the work year, heating period, nonheating period, each month, and for 10 weather patterns were determined for 1962. The SO2 load is pictured as a two-dimensional representation for each case. The representations are used to describe small variations in size during the year of observation. The relative frequency of the occurrence of levels over 0.05 mg/cu m is represented. The frequency maps indicate that the level of pollution is based upon domestic heating. Sulfur dioxide levels vary from place to place, but at any specific point an average measurement value is sufficient to characterize the SO2 level in an industrial area. (Author abstract)

1964

60593 **APTIC NO. 82175**

OPERATION CARBON MONOXIDE. *(Operation oxyde de carbone). Text in French. Lab. Munic., Prefect. Police, Paris no. 51.581 D/PA Part I:2-31, Nov. 1964.*

Of 14,899 measurements at 317 monitoring sites in Paris, 716 (4.8%) registered levels of carbon monoxide above 100 ppm. Most of the measurements for 1960 to 1963 were below 30 ppm, often consisting of a notable level of air pollution. Air pollution in tunnels also reached a series level, 30 to 40 ppm, in 1963. The pollution of traffic tunnels is roughly proportional to the length of the tunnel. Thirteen percent of the drivers in a study of drivers, workers, and others evinced an elevated carboxyhemoglobin level (2.0 to 2.4 ml CO/100 ml blood). Author abstract)

60594 **APTIC NO. 82177**

OPERATION LOOP OF THE SEINE. *(Operation Boucle de la Seine). Text in French. Lab. Munic., Prefect. Police Paris no 51.581 D/PA Part III:51-71, Nov. 1964.*

Using 22 Owens gauges, dust fall levels were monitored in an area northwest of Paris, in Paris, and in Bievres. The results in the northwest section are tabulated; the majority of these gauges registered between 400 and 1000 g/100 sq m/mo for 1959 to 1963. The mean level for 1963 was 757 g/100 sq m/mo, and represents a decrease from 942 g in 1959. The dusts were analyzed for cinder content, insoluble dust, 3,4-benzopyrene, pH, and ion content. Results for 1963 are presented graphically. The average level of 3,4-benzopyrene in 1963 was 3.6 microgram/g. Two thermal power plants are believed to be the source of this dust fall; the decreased consumption of coal by these plants is correlated with the decreased dust fall. (Author abstract)

60595 **APTIC NO. 82179**

OPERATION SMOKE-LESS ZONES. *(Operation Zones sans fumee). Text in French. Lab Munic., Prefect. Police Paris no. 51.581 D/PA Part IV:72-92, Nov. 1964.*

Two zones of Paris were established as smokeless areas. Using 31 Owens gauges, dust fall measurements were made in these two areas and in adjacent areas. The sites of these gauges are described. Most dust fall gauges in Paris generally yield 500 to 1000 g/100 sq m. Levels of 3,4-benzopyrene at all 31 gauges averaged 2.7 mg/100 sq m in 1963. The dust levels in these sections of Paris are similar to those obtained in 1963 in the Loop of the Seine operation. Levels of 3,4-benzopyrene at the different gauges are tabulated; a slight increase in 3,4-benzopyrene pollution to 3.4 microgram/g dust occurred in 1963. Smokeless areas generally exhibited lower levels of air pollution than neighboring areas. (Author abstract)

1958

60596 **APTIC NO. 42696**

Bourne, H. Gardner, Jr.

REPORT NEW METHOD FOR STUDYING AIR POLLUTION. *Heating, Piping, Air Conditioning, 30(3):139-141, March 1958.*

Air pollution studies were initiated in the area of one of several ferroalloy plants in the area between Steubenville and Gallipolis, Ohio as an aid in the evaluation of public complaints concerning emissions of smoke and fume. The strongest grievance was alleged by those living north and northeast of the plant. Their point was proven by an analysis of a 2 yr record of hourly wind direction observations. Smoke and fume 300 ft downwind were collected using a thermal precipitator and the size of the particles determined using an optical microscope with 1000X magnification. Eighty-five percent of the particles were less than 0.7 micron and 15% were smaller than 0.3 micron. To efficiently collect these small particles, a homemade portable electrostatic precipitator was used which could be run from a common 6 volt car storage battery. Samples were collected at random one day a week regardless of meteorological conditions. From March to the end of December 1955, 36 samples were collected and analyzed for manganese, silica, and total dusts and fume. At 1 to 2 miles from the plant, total dust and fume averaged 1500 micrograms/cu m; manganese, 2 to 30 micrograms; and silica, 5 to 85 micrograms. Opentop polyethylene canisters were used to determine dustfall levels on porches and window sills of homes in the area.

1954

60597 **APTIC NO. 45038**

Fehnel, J. W.

SOME PHASES OF THE OCCUPATIONAL AND ATMOSPHERIC PROGRAMS OF THE REPUBLIC STEEL CORPORATION. *Air Repair, 3(3):157-162, Feb. 1954.*

Activities of the Republic Corp. since 1933, with regard to evaluation of occupational hazards and pollutant emissions at Corporation facilities, are reviewed. Periodic comprehensive industrial health surveys have been conducted at Republic plants since 1935. Investigations have sometimes been undertaken as a result of employee complaints. One such investigation concerned the use of sodium fluoride as a mold addition in the making of rimmed steel; however, air samples and physical examinations of workers indicated no probable hazard or chronic effects. As a result of complaints concerning dust and smoke emissions from one of the Cleveland District operations, a series of air pollutant samples were obtained at 14 stations, seven in or bordering on the complaint area, and seven in other industrial and residential areas of Cleveland. Pollutants surveyed included: sulfur dioxide, carbon dioxide, carbon monoxide, phenol, cyanides, dust fall, and dust counts. The studies revealed no significant differences in pollutant concentrations between the complaint area and other areas of Cleveland. With regard to soluble sulfur determinations, the concentrations were practically the same during periods of plant operation. Paint discoloration tests with hydrogen sulfide samples have also been instituted. A panel body truck has been outfitted for atmospheric and plant survey work. Expenditures for pollution control devices are reviewed.

1929

60598 **APTIC NO. 45081**

Shrader, J. H., Maurice H. Coblentz, and Ferdinand A. Korff

EFFECT OF ATMOSPHERIC POLLUTION UPON INCIDENCE OF SOLAR ULTRA-VIOLET LIGHT. *Am. J. Health, 19(7):717-724, July 1929. 17 refs. (Presented at the American Public Health Association, Health Officers Section, Annual Meeting, 57th, Chicago, Ill., Oct. 16, 1928.)*

Results of tests of the effect of atmospheric pollution on the incidence of solar ultraviolet light in Baltimore are presented. Solar ultraviolet light was measured by the lithopone method and checked by three other chemical methods (methylene-blue-acetone-water solution, uranyl sulfate, and the potassium iodide test). Dust-cups and konimeter measurements of atmospheric pollution indicated that this was heaviest in the center of the city and fell off to approximately 1/6 as much in the country. The amount of ultraviolet light in the country was 50% greater than in the city. In the city, the amount of settled dust on the top of a tall building was materially less than at street level, while the incidence of solar ultraviolet light on the building was greater than at street level. Measurements made on clear days showed a somewhat greater incidence of ultraviolet light than on cloudy days. The passage of ultraviolet light through confined air artificially polluted with fuller's earth, street sweepings and lampblack, respectively, showed that the latter are more effective in occluding solar ultraviolet light. Skyshine yields about 70% of the amount of ultraviolet light received by direct sunlight. In conclusion, (1) the lithopone method is dependable for field use in measuring solar ultraviolet light; (2) the belief that atmospheric pollution actually occludes ultraviolet light to a very great extent is well founded; (3) the constituents of atmospheric pollution in summer are greater in quantity and different from those in winter, (4) skyshine is equivalent to about 70% direct sunshine in content of ultraviolet light; and (5) carbon as tarry products is materially more inhibitive to the incidence of ultraviolet light than siliceous materials.

ATMOSPHERIC INTERACTION

1976

60599 **APTIC NO. 83345**

Angell, J. K. and J. Korshover

GLOBAL ANALYSIS OF RECENT TOTAL OZONE FLUCTUATIONS. *Monthly Weather Rev., 104(1):63-75, Jan. 1976. 14 refs.*

Total ozone data for various regions of the world were examined on a seasonal and annual basis. In the United States and Britain there was a significant 2% reduction in O3 between 1970 and 1974, although the annual rate of decrease diminished from 0.7% between 1971 and 1972 and 0.2% between 1973 and 1974. There is no evidence of any effect on the O3 shield due to the large Russian nuclear explosions in 1961 and 1962. There was no evidence of a decrease in total O3 over Japan during the passage of radioactive clouds following individual Chinese tests in 1968, 1969, and 1970. The Southern Hemisphere O3 values were anomalously high following the eruption of Mt. Agung. The decrease in total O3 between 1970 and 1974 was associated with the decrease in sunspot number following the sunspot maximum in 1969. There was some decrease in total O3 in northern latitudes following intense solar flares in 1960, 1966, and 1972, but the relationship is not conclusive. (Author abstract modified)

60600 **APTIC NO. 83769**

Cleveland, W. S., B. Kleiner, J. C. McRae, and J. L. Warner

PHOTOCHEMICAL AIR POLLUTION: TRANSPORT FROM THE NEW YORK CITY AREA INTO CONNECTICUT AND MASSACHUSETTS. *Science, 191(4223): 179-181, Jan. 16, 1976. 15 refs.*

The transport of photochemical air pollution in the region of the northeastern United States covering eastern New York, northern New Jersey, Connecticut, and Massachusetts between May 1, 1974 and Sept. 30, 1974 was investigated. Photochemical air pollution resulting from primary emissions in the New York City metropolitan area was transported by prevailing winds on a 300 km northeast trajectory through Connecticut and as far as northeastern Massachusetts. Southwestern Connecticut had the highest ozone concentrations in the region. There was a substantial increase in O3 concentration in Massachusetts. The O3 concentrations of air entering the New York City metropolitan area were often already above the Federal standard of 0.08 ppm, but the concentration distribution was well below concentration distributions at downwind sites in Connecticut. (Author abstract modified)

60601 **APTIC NO. 84247**

Harlfinger, O.

THE BIOCLIMATIC IMPORTANCE OF THE HOELLENTAELER WIND FOR FREIBURG. *(Die bioklimatische Bedeutung des Hollentaelers fuer Frieburg). Text in German. Meteorol. Rdsch., 29(1):15-18, 1976. 12 refs.*

The bioclimatic significance of an alpine wind (Hoellentaeler) for Freiburg is discussed. The wind effect varies greatly depending on the location within the city; its speed is only slightly lower during the winter than the yearly average. The wind velocity during the summer ranges from 1.6-4.9 m/sec and is much lower during the winter, but is still 2 m/s. This magnitude results in diminished sulfur dioxide peaks. As for dust pollution, the higher convection in the afternoon, particularly during the summer, leads to a temporarily reduced atmospheric dust content, with a maximum wave of dust pollution in the forenoon and a secondary one late at night. The medical meteorological monitoring site values collected from 1972-1974 showed a single wave maximum in late morning and a minimum at 3-6 am, indicating a cleansing process by the alpine wind. While the wind helps to renew and improve the air during the winter, its chief merit during the summer is its cooling effect. The cooling value rapidly increases and reaches a maximum of about 20 mcal/sq cm sec within the covering area of the wind during high-pressure situations in summer, spring, and fall. Generally, the temperature drops after the onset of the wind. Its refreshing effect is attributable not only to stronger wind movements, but also to the lower temperature. From the standpoint of planning, its bioclimatic effect should be preserved and hospitals, old-age homes, and apartments for cardiovascular patients located within the area of the wind effect.

60602 **APTIC NO. 84555**

Koizumi, K.

POLLUTION OF RAINWATER AND ITS LOAD OF POLLUTION ON WATERS AROUND THE BAYS OF ISE AND MIKAWA. *(Isewan, Mikawawan shuhen Kou no odakuka to odaku fuka ni tsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 12(5):19-28, 1976.*

The rainwater samples on Jan. 21 after 50-60 days of no rainfall on Feb. 5 and on Aug. 25-26 1974 by Typhoon No. 14 were collected at the rate of 1 liter per mm of precipitation at 7 points around the Ise Bay and 5 points around the Mikawa Bay. The analyses of these water samples showed the range of contents of sulfate ion, nitrate ion, and chloride ion, respectively, to be 3.4-29.0; 5.2-17.2; 0.6-20.6, (0.04-0.260; 0.030-0.135; 0.046-0.231), and (1.1-5.9; 0.5-1.4; 2.30-9.35), the unit being ppm. After averaging these total values by location, the value was compared to the averaged value of all Japan published in 1964, as follows. The sulfate ion contents were 9.4 (Ise Bay), 7.2 (Mikawa Bay), and 4.49 (all Japan); nitrate ion was 0.458 (Ise), 0.352 (Mikawa) and not shown in 1964; and the chloride ion was 2.9 (Ise), 3.2 (Mikawa) and 1.1 (all Japan). The pH value of the water samples was 4.2-4.9 (Jan. 21), 3.8-5.2(Feb. 2), and 4.3-6.4 (Aug. 25-26). The increase of these ion concentrations and the reduction of pH, especially near industrial zones and in large cities is due to air pollution. The biological effects of such acidic rainfall were briefly described.

60603 **APTIC NO. 83344**

Possiel, Norman

CURVATURE OF THE WIND PROFILE IN THE TROPOSPHERE VERSUS REGIONS OF CAT AND NON-CAT IN THE STRATOSPHERE. *Monthly Weather Rev., 104(1):57-62, Jan. 1976. 19 refs.*

The theoretical importance of the curvature of the wind profile to the amplitude of mountain waves and mechanisms favorable for clear air turbulence (CAT) are discussed in relation to such wave motions. The CAT encountered by the XB-70 aircraft in the stratosphere during expected mountain wave conditions was related to the vertical gradient of curvature of the wind profile in the troposphere. Computations were based upon meteorological data obtained from rawinsondes and turbulence data from 17 flights of the aircraft. An analysis was made of the aerial variations of the vertical gradient of the curvature term in the Scorer parameter in relation to the location of the turbulent and non- turbulent regions. A total of 89% of the turbulent regions in the stratosphere occurred in expected mountain wave areas and 79% were located where the vertical gradient of curvature was positive in the 10-30,000 ft layer below. For the non-turbulent regions, 74% were outside expected mountain wave areas and 98% occurred where the vertical gradient of curvature was negative. (Author abstract modified)

60604 **APTIC NO. 83073**

Retalis, Dimitris and Pantelis-Marios Zervos

STUDY OF THE ELECTRICAL CONDUCTIVITY OF THE AIR ABOVE ATHENS. *J. Atmospheric Terrest. Phys., 38(3):299-305, March 1976. 18 refs.*

The diurnal and annual variation of positive and negative conductivity of the atmosphere above Athens was analyzed for all weather as well as for fair weather separately, for 1968 to 1972. The diurnal variation of positive and negative conductivity revealed a double oscillation. The maxima occurred between 3 and 4 am and between 4 and 5 pm, and the minima between 7 and 9 am and 8 and 11 pm. The annual variation of conductivity reached a maximum during the summer and a minimum during the winter. The values of conductivity at the National Observatory of Athens were low, owing to the existing air pollution. Fourier analysis was applied to the data. The contribution of each individual harmonic oscillation to the formation of the diurnal course of conductivity varied according to the month considered. The 12-hr harmonic presented the strongest contribution. (Author abstract modified)

60605 **APTIC NO. 83673**

Sommers, Hans, Heinz Bathke, and Otto Menzel

STUDIES OF THE DISPERSION OF OFF-GASES IN THE VICINITY OF A NATURAL GAS FIRED CENTRAL HEATING STATION. *(Untersuchungen zur Ausbreitung der Abgase im Nahbereich einer erdgasbefeuerten Heizzentrale). Text in German. Gas Wasserfach, Gas/Erdgas (Munich), 117(2):68-77, 1976. 32 refs.*

The dispersion of flue gases and the dilution of the flue gas components were studied in the vicinity of a natural gas-fired central heating plant operating at an average capacity of 0.9 Gcal/hr. The sulfur content of the natural gas was not greater than 1 mg/cu m. Air samples were taken with six samplers on building fronts at distances of 20-50 m from the emission source. The specific nitrogen oxides emission was 110-170 g/Gcal. The SO2 concentrations in the flue gas were below 0.2 mg/cu m. The aldehyde concentrations amounted to about 10% of those reported in different literature sources. None of the nitrogen oxides concentrations measured at 20-50 m distance was higher than 0.05 ppm, and 95% of all values were below 0.04 ppm. The measurements indicate nitrogen oxides concentrations well below the standards in the vicinity of the heating power plant. A comparison with concentrations calculated according to VDI Guideline No. 2289/2 shows that the calculated values are about 10 times higher than the measured concentrations.

60606 **APTIC NO. 81421**

Struempler, A. W.

TRACE METALS IN RAIN AND SNOW DURING 1973 AT CHADRON, NEBRASKA. *Atmos. Environ., 10(1):33-37, 1976. 16 refs.*

Rain and snow samples collected during 1973 in Chadron, Nebraska, a rural location 480 km north-northeast of Denver, Colorado were analyzed for trace metal content by flamelss atomic absorption spectrometry to determine baseline metal concentrations in precipitation before thee operation of additional coal-fired power plants in the area. The concentrations of silver, aluminum, cadmium, copper, manganese, lead, and zinc in samples of rain and snow averaged 8.4 times 10 to the -11, 3.5 times 10 to the -7, 3.1 times 10 to the -10, 4.4 times 10 to the -9, 5.2 times 10 to the -9, 4.8 times 10 to the -9, and 1.0 times 10 to the -8 g/cu cm, respectively. A greater concentration of the elements, except for copper, was found in rainwater from convective storms showers as compared to extended rains. Aluminum and manganese were largely soil derived, while silver and cadmium were more associated with anthropogenic sources. Depositions of silver, aluminum, cadmium, copper, manganese, lead, and zinc by precipitation to the earth s surface during 1973 were respectively: 0.34, 1400, 1.2, 18, 21, 19, and 40 g/hectare/yr. (Author abstract modified)

60607 **APTIC NO. 83875**

Suzuki, Shin

SUMMARY OF 15TH JAPAN SOCIETY OF AIR POLLUTION SYMPOSIUM IN CHIBA CITY. *(Chibashi ni okeru dai 15 ai taiki osenkenkyu zenkoku kyogikai shinpoziumu no gaiyo). Text in Japanese. Taiki Osen Nyusu (Air Pollution News), no. 92:2-8, Jan. 1976.*

The summary of the 15th National Convention of the Society of Air Pollution is reported. The convention was held in Chiba City on November 5-8 in 1974. The first day s symposium was titled Study on Atmospheric Photochemical Reaction, in which the atmospheric reactions of nitrogen oxides and sulfur oxides were discussed. Reactions occurring among substances collected on filters were studied using the Metal Membrane Method in conjunction with the X-ray dispersion type microanalyzer to prevent such reactions. Smog chambers and their related problems were discussed; there is a limit in terms of concentration for measurement of nitrogen oxides and the chemiluminescent method is better suited than the Saltzman method for a cahmber test of nitrogen oxide analysis. There are differences between the nitrogen oxide value measured by the chemiluminescent method and the value measured by the Saltzman method.

60608 **APTIC NO. 83046**

Sze, Nien Dak and Mao Fou Wu

MEASUREMENTS OF FLUOROCARBONS 11 AND 12 AND MODEL VALIDATION: AN ASSESSMENT. *Preprint, American Society for Testing and Materials, Philadelphia, Pa., 30p., Dec. 15, 1975. 22 refs. (Presented at the American Society for Testing and Materials Conference on Ozone, March 22, 1976.)*

Data on the tropospheric levels of trichlorofluoromethane (Freon-11) and dichlorodifluoromethane (Freon-12) are reviewed and analyzed. Model calculations indicate that Freon-11 may possess a relatively short lifetime on the order of about 10 yr. Projected 10-20 fold increases in the future concentrations of Freon-11 and Freon-12 are shown to be a consequence of the assumption that the tropospheric lifetimes of each fluorocarbon are infinite. On the other hand, a 10-year lifetime results in atmospheric levels only twice those of present (1975) levels if production is held constant at the 1975 rate. Present model analysis does not preclude the possibility of a 10-20-year sink for each fluorocarbon. Model predictions of future fluorocarbon levels must be considered qualitative in nature because of the large uncertainties in the tropospheric lifetimes for both Freon-11 and Freon-12. (Author conclusions modified)

1975

60609 **APTIC NO. 82824**

Akagi, Yasuharu, Takiya Kishimoto, Tomohiro Hara, and Teruo Takahashi

A PREDICTION OF SOX CONCENTRATION IN MIZUSHIMA (I). *(Mizushima chiku no SOx nodo no yosoku (I)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):260, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 146.)*

For the purpose of improving the prediction accuracy of a wide range of air pollution by the plume equation, relationships between sulfur oxides pollution in the Mizushima area and meteorological conditions were investigated, and diffusion parameters for various meteorological conditions were estimated. The average diurnal variation of SOx on days with concentrations higher than 0.1 ppm during July and Aug. 1973 showed a definite correlation between high SO2 concentration and sea breeze. For the simplification of the calculation, small pollutant sources were ignored in the calculation; the accuracy was found to be sufficiently high. The accuracy using data obtained at one monitoring station was compared with that using average values from five monitoring stations; the use of one well chosen location was found to be sufficiently representative. Diffusion parameters, based on the average of 360 hr, were given as ky equals 0.991 and kz equals 0.0474. Concentration distributions were calculated using these parameters for nine locations, and the average difference from the observed value was about 10%.

60610 **APTIC NO. 84172**

Akagi, Yasuharu, Takiya Kishimoto, Tomohiro Hara, and Teruo Takahashi

A PREDICTION OF SOX CONCENTRATION IN MIZUSHIMA. II. *(Mizushima chiku no SOx nodo no yosoku. II.). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Polution), 10(4):261, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 147.)*

The optimum diffusion parameters for a sulfur oxides concentration simulation model of the Mizushima area were obtained using data from 1973. Diurnal and seasonal variations were investigated. The diffusion function Ky was lower at 12:00-16:00, and higher before and after these hours. The variation in Kz was similar; however, its seasonal variation was higher. The relationship between wind velocity and Ky or Kz was linear during the summer; the correlation coefficients were 0.887 for Ky and 0.950 for Kz. In other seasons, the correlation between Ky and wind velocity was also significant (correlation coefficient above 0.744); however, that between Kz and wind velocity was lower. Using the parameters obtained from 1973 data, the SOx concentrations were calculated for 1972 and 1974, and the relative error with respect to measured values was obtained. The range of error was about 20% for 1973, 30-40% for 1972 and 1974, and was considered to be due to measurement errors of wind velocity.

60611 **APTIC NO. 76573**

Akazuka, H.

A SEA BREEZE AND OXIDANT CONCENTRATION IN YOKKAICHI CITY. *(Yokkaichi-shi no kaifu to okishidanto nodo). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs., no. 8:74-75, Sept. 1975.*

The occurrence of a high oxidant level (more than 0.1 ppm) in Yokkaichi city for 1972 through 1974 is summarized in relation to local sea wind. The transition period of sea and land winds affected the observation of high oxidant levels. Whenever this transition occurred with exceptional strength, the higher oxidant level of more than 0.1 ppm tended to be observed. Most (75.6%) of the high oxidant level occurrences in April through September coincided with the apparent transition. The high oxidant level tended to be observed when the height of the sea wind was between 300 to 800 m, with the highest frequency between 400 to 500 m. The distribution of atmospheric pressure that most affected the high oxidant level was when a high pressure area was located to the west or above the city, generating a SE ground wind of 2 to 4 m/sec velocity. The best correlation of the occurrence of high oxidant level with these meteorological factors was observed in August.

60612 **APTIC NO. 83140**

Akiyama, Fumiki and Norikazu Hara

A STUDY ON AN ANALYSIS OF THE CITY AIR CONTAMINATION FACTOR AND A PREDICTION OF THE DENSITY OF NITROGEN OXIDES IN THE CITIES CAUSED BY THE CAR. *(Toshi no kuki osenkeisu to schisso sankabutsu nodo no kaiseki). Text in Japanese. Tohoku Kogyo Daigaku Kiyo (Mem. Tohoku Inst. Tech.), no 10:1-8, Nov. 1975. 8 refs.*

A model used for the calculation of the automotive air pollution coefficient and for prediction of the nitrogen oxides concentration is described. The pollution coefficient is structured to increase in economically developed industrial cities proportionally to the increase in traffic congestion, registered automobiles, and accident rates. The air pollution coefficients actually measured in Osaka, Nagoya, Yokohama, and Kobe were 29, 27.5, 19.5 and 15.7, respectively, which are very close to the figures obtained by the prediction equation using the seven city traffic environment parameters, 29.2, 26.4, 18.8, and 17.3, respectively. For analysis and prediction of the concentration of national urban NOx, multiple city traffic environmental parameters were also used. The NOx concentration was positively correlated with traffic congestion, pollution, and accidents, and inversely correlated with traffic safety. The actual maximum urban NOx concentration measured was 0.23 ppm in Osaka City, and the minimum was 0.06 ppm in Odawara City. Sixty-eight percent of the NOx source was attributed to automobiles; however, if the NOx concentration is measured only during the hours of 8 am and 6 pm, the prime automobile traffic time, the above percentage will be increased.

60613 **APTIC NO. 80275**

Andren, A. W., S. E. Lindberg, and L. C. Bate

ATMOSPHERIC INPUT AND GEOCHEMICAL CYCLING OF SELECTED TRACE ELEMENTS IN WALKER BRANCH WATERSHED. *Oak Ridge National Lab., Oak Ridge, Tenn., Environmental Sciences Div., Energy Research and Development Administration Contract W-7405-eng-26, Rept. 728, 68p., June 1975. 74 refs.*

Integrated studies of atmospheric and aquatic chemistry were used to quantify the cycling of selected trace elements in Walker Branch Watershed, Oak Ridge, Tennessee. Comprehensive data were collected for rain and dry fallout as well as for stream dissolved and particulate output for a 6 mo period. Comparison of elemental ratios in rain to those of soil indicate that cadmium, copper, mercury, and lead in rain are enriched with respect to soil by 1 to 3 orders of magnitude and must thus have a nonsoil source. Fly ash ratios from a coal fired steam plant for Cu and Hg and possibly zinc and Cd are comparable to rain ratios. Chromium and manganese seem to be soil derived whereas Pb can be attributed to automotive emissions. The concentration of 34 elements has also been measured in air particulate matter. Using enrichment factor calculations, the data indicate that 16 elements have a natural geochemical origin whereas arsenic, silver, gold, bromine, Cd, chlorine, cobalt, Cu, Hg, iodine, sodium, Pb, sulfur, selenium, vanadium, and Zn are enriched. Arsenic, Co, Cu, Hg, Se, V, and Zn possess enrichment factors very close to those of fly ash and can thus tentatively be attributed to coal fired steam plants in the vicinity of Oak Ridge. Based on elemental concentrations in air and previously measured deposition velocities, the dry input as a percentage of total input was estimated for Cd, chromium, Cu, Hg, Mn, Pb, and Zn. Only Cr and Mn have a significant dry deposition component constituting approximately 21 and 16%, respectively, of the total deposition. Data on stream water trace element transport and speciation in dissolved and particulate forms for a 6 mo period are also reported. Concentrations of trace elements in the dissolved fraction were relatively constant. Concentrations of the same elements on particulate material vary considerably from month to month, indicating the complexity of suspended sediment source mechanisms. A 6 mo elemental mass balance shows that the watershed retains 97 to 98% Pb, 94 to 95% Cd, 82 to 84% Cu, 59% Cr, 57% Mn, 73 to 75% Zn, and 69 to 75% Hg. (Author abstract modified)

60614 **APTIC NO. 81827**

Andren, A. W.

GEOCHEMICAL CYCLING IN A WATERSHED: MEASUREMENTS OF ATMOSPHERIC INPUT. *Am. Chem. Soc. Div. Environ. Chem. Prepr., 15(2):48-49, 1975. (Presented at the American Chemical Society, Division of Environmental Chemistry, National Meeting, 170th, Chicago, Ill., Aug. 24-29, 1975.)*

The atmospheric input (wet deposition and aerosol impaction) of selected elements at the 97.5-hectare Walker Branch Watershed in Oak Ridge, Tennessee was studied. Wet deposition data for the period June 1973 to July 1974 indicated considerable enrichments for cadmium, copper, mercury, and lead with respect to the soil. Enrichment with respect to the soil resulting from airborne particulate matter was found for silver, arsenic, gold, bromine, cadmium, chlorine, cobalt, copper, mercury, iodine, sodium, lead, sulfur, selenium, vanadium, and zinc.

60615 **APTIC NO. 76537**

Angell, J. K. and A. B. Bernstein

FLOW ACROSS AN URBAN AREA DETERMINED FROM DOUBLE-THEODOLITE PILOT BALLOON OBSERVATIONS. *J. Appl. Meteorol., 14(6):1072-1079, Sept. 1975. 7 refs.*

Double theodolite pilot balloon observations at 6-minute intervals for six 2-hour periods were made at two sites upwind and two sites downwind of Oklahoma City. During the 3 days of the experiment the wind speed was a maximum downwind of the city, and the tetroon height traces suggest that this speed maximum resulted from the downward transport of the faster moving air aloft due to a sinking motion in the lee of the city induced by the barrier or the heat island effect of the city. The derived wind speed and direction fluctuations (of at least a 15-minute period) are a maximum near city center, with low level speed fluctuations 60% greater than over rural areas. Lagged correlations between stations suggest that, over and upwind of the city, these speed fluctuations are transported approximately with the mean wnd, but downwind of the city the fluctuations occur nearly simultaneously at different locations, presumably indicating the effect of the city in breaking up coherent, traveling flow structures. (Author abstract modified)

60616 **APTIC NO. 84629**

Aoyama, Mitsuko and Akinori Usuda

ON ULTRAVIOLET RAYS VOLUME AS PHOTOCHEMICAL SMOG GENERATED. *(Kokagaku sumogu hasseibi no shigaisenryo ni tsuite). Text in Japanese. Preprint, Japan Society of Public Health, Tokyo, p. 396, 1975. (Presented at the Japan Society of Public Health, Lecture Meeting 34th, Yokohama, Oct. 1975, Paper 610.)*

The correlation between the amount of ultraviolet light reaching the city and the number of filed complaints of photochemical smog was examined in Nagoya City, Japan. The amount of ultraviolet (UV) light at an altitude of 10 m from the ground was measured using a selenium photocell. The investigation was conducted from May through September. During this period, two complaints were filed each month in May, June, and July. One complaint was filed each month in August and September. Whenever the measured UV light exhibited a pattern with a gradual hourly increase of UV light peaking during 11:00 am to 2:00 pm, no complaints of photochemical smog were filed. However, the days on which a complaint was filed had extreme hourly changes of the amount of UV light. For 90% of the days on which a complaint was filed, the amount of UV light during the period from 10:00 am to 12:00 pm was small or did not increase. A comparison of the amount of UV light on days with and without filed complaints was made. The average amount of UV light in the morning was 0.69 to 1.74 mw/sq cm on days with filed complaints, and 1.97 to 2.46 mw/sq cm on days without filed complaints. The average amount of UV light in the afternoon was 0.86 to 1.90 mw/sq cm and 1.50 to 2.04 mw/sq cm, respectively. A correlation between visibility and photochemical smog complaints was drawn: the visibility was poorer for days on which complaints were filed.

60617 **APTIC NO. 82360**

Armstrong, R. J., K. Maseide, and J. Troim

A NITRIC OXIDE RELEASE IN THE HIGH LATITUDE IONOSPHERE. *J. Atmospheric Terrest. Phys., 37(5):797-813, May 1975. 27 refs.*

The reaction of nitric oxide with atomic oxygen has a high photon yield. This reaction has been used to deduce atomic oxygen densities in the upper atmosphere. Nitric oxide gas was released in a series of short high-pressure bursts through a small nozzle over the altitude range 62 to 120 km. A total mass of 8 g of the gas was ejected. The light from the reaction was observed by four photometers on board the rocket. Three of these had narrow-bandwidth filters, enabling spectral information to be obtained. The fourth photometer had a broad spectral sensitivity. The high reaction rate found earlier in similar experiments was confirmed. However, the spectrum of the emission varied with altitude. The conventional interpretation of the headglow in terms of a simple reaction of nitric oxide with ground state atomic oxygen must be regarded with caution. This reaction may not be the only one occurring. (Author abstract modified)

60618 **APTIC NO. 84093**

Artemyev, A. V.

TOWARDS THE THEORY OF SEASONAL VARIATIONS IN ATMOSPHERIC OZONE. *(K teorii sezonnykh variatsii atmosfernogo ozone). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery Okeana, 11(11):1161-1168, Nov. 1975. 16 refs.*

Seasonal variations in atmospheric ozone were estimated via numerical solution of the time-dependent equation of ozone distribution under the effect of dynamic (advection and macroturbulence) and photochemical factors. The obtained results on the seasonal dynamics of total ozone content and changes in its vertical profile were in sufficient agreement with the results of observations over a wide range of latitudes. Quantitative estimation of the downward flow of ozone on the level of the tropopause indicated a determining mechanism of ozone penetration into the troposphere, and described its intensity as a function of latitude, being more intense in high latitudes and less intense in lower ones. This reduction in the intensity of ozone penetration as latitude decreased was most clearly manifested in the spring. In all seasons, a sharp increase in the ozone flow was noted at 30-35 deg latitude, possibly due to a break in the tropopause at these latitudes.

60619 **APTIC NO. 76470**

Atwater, Marshall A.

THERMAL CHANGES INDUCED BY URBANIZATION AND POLLUTANTS. *J. Appl. Meteorol., 14(6):1061-1071, Sept. 1975. 23 refs.*

A numerical model of the planetary boundary layer, based on the Eulerian conservation equation, is used for two- and three-dimensional simulations of wind, temperature, specific humidity, and pollutant concentration within the boundary layer surrounding urban areas. The variations of the terrain are included in the simulations. Two- and three-dimensional simulation of the thermal structure and pollutant concentrations are highly correlated. The simulated urban heat island and vertical thermal structure compare realistically with observations. The temperature changes caused by radiatively active pollutants are generally smaller than effects induced by other urbanization factors. During daytime, the presence of radiatively active pollutants results in increased vertical stability and higher concentrations near the surface when compared with radiatively inactive pollutants. (Author abstract modified)

60620 **APTIC NO. 80130**

Auer, August H., Jr.

THE PRODUCTION OF CLOUD AND AITKEN NUCLEI BY THE ST. LOUIS METROPOLITAN AREA (PROJECT METROMEX). *J. Rech. Atmospheriques, 9(1):11-22, Jan.-March, 1975. 5 refs.*

Cloud condensation and Aitken nucleus concentrations were observed in and near St. Louis, Missouri. Cloud nuclei concentrations at activating supersaturations from 0.2% to 3.5% were measured with a thermal diffusion chamber. Air samples were gathered by aircraft at various locations, upwind and downwind of the metropolitan area. The downwind concentrations of cloud nuclei generally increased twofold over the corresponding upwind concentrations for activating supersaturations from 0.5% to 3.0%. Routine measurements of the differences in the cloud condensation and Aitken nucleus concentrations upwind and downwind of the metropolitantSt. Louis area yield a difference in concentrations of approximately 1.1 times 10 to the 3rd power/cu cm and 4 times 10 to the 4th power/cu cm, respectively. The production rates of anthropogenic nuclei were stratified according to various locales within the St. Louis metropolitan area. The production rates of cloud condensation nuclei in the industrial areas appears to exceed that of the metropolitan residential areas by approximately one order of magnitude. The integrated averages of the total cloud condensation nucleus production rates from the metropolitan area are 0.43 times 10 to the 4th power, 0.75 times 10 to the 4th power, and 1.73 times 10 to the 4th power nuclei/sq cm/sec for activating supersaturations of 0.5, 1.0, and 3.0%, respectively. The integrated average of the total Aitken nucleus production rates from the metropolitan area is approximately 44 times 10 to the 4th power nuclei/sq cm/sec.

60621 **APTIC NO. 81983**

Avis, Lee M., Richard E. Turner, and Thomas H. Rees

A GENERALIZED TENSOR FORMULATION OF ATMOSPHERE AND SEAS DYNAMICS (TECHNICAL REPORT). *National Aeronautics and Space Administration, Hampton, Va., Langley Research Center, Work Unit 176-24-31-02, Rept. NASA TR R-441, 64p., Sept. 1975. 11 refs.*

A generally valid, but simple, mathematical model suitable for simulating atmospheric and oceanic dynamic motions and pollution transport is presented. It was formulated in general tensor notation, and in the conservation equations, the density and vertical scale factor have been grouped together to form a generalized density variable suitable for oceanic or atmospheric simulation. The quasi-horizontal bottom coordinate surface has been deformed to follow real Earth terrain, whereas the top coordinate surface moves vertically with the oceanic or atmospheric free surface. The intermediate coordinate surfaces are allowed to move freely. External gravity waves can be represented by the top coordinate surface, and meteorological fronts and inversion layers in the atmosphere and refractive layers in the seas can be represented with enhanced resolution by the internal quasi- horizontal coordinate surfaces. The action of subgrid mixing has been represented as true sensor quantities, which corrects a deficiency in the intuitive subgrid mixing formulation, so that rigid body rotation of the atmosphere under adiabatic conditions is an allowed solution. (Author abstract)

60622 **APTIC NO. 75998**

Axetell, Kenneth, Jr.

APPLICATION OF THE HIWAY MODEL FOR INDIRECT SOURCE ANALYSIS: USERS S MANUAL (FINAL REPORT). *Office of Air and Waste Management Order No. 5-02-3670A, Rept. EPA-450/3-75-072, 90p., Aug. 1975. 8 refs.*

NTIS: PB 245250/AS

A method for employing the Environmental Protection Agency s HIWAY model for the microscale analysis of proposed indirect sources is described. Carbon monoxide emissions occurring within parking lots are first characterized as line sources of pollution. The line source dispersion model (HIWAY) is then used to estimate the maximum impact of emissions from motor vehicles in parking lots on 1- and 8-hour ambient CO concentrations in the nearby area. (Author abstract modified)

60623 **APTIC NO. 76103**

Bach, W. D., Jr.

INVESTIGATION OF OZONE AND OZONE PRECURSOR CONCENTRATIONS AT NONURBAN LOCATIONS IN THE EASTERN UNITED STATES, PHASE II, METEOROLOGICAL ANALYSIS (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Office of Air and Waste Management Contract 68-02-1077, Program Element 1HA326, Rept. EPA-450/3-74-034-A, 157p., Feb. 1975. 16 refs.*

NTIS: PB 246899/AS

The meteorological conditions occurring during measurements of ozone at four nonurban locations in Ohio, Pennsylvania, Maryland, and West Virginia were examined in terms of their influence on ozone concentrations at the synoptic time and space scale. Air parcel trajectories at the 900 mb level were examined over 48-hour periods prior to the arrival of ozone at a given location to assess the possible influence of ozone transport across urban-industrial areas on measured non-urban ozone concentrations. Time-altitude sections of potential temperature and stability from the ground to 5 km in altitude at four nearby rawinsonde locations revealed that major anomalies in the vertical structure of the lower troposphere were related to the occurrence of high ozone concentrations. A regression analysis of 12-hour average ozone concentrations as a function of properties of the mixed layer showed that the mean mixing ratio of the layer was the most significant variable affecting ozone levels, with mixing depth being the next most significant variable. Average hourly ozone concentrations did not exceed 160 micrograms/cu m when the daily temperature was less than 16.5 C. (Author abstract modified)

60624 **APTIC NO. 80004**

Barton, I. J. and D. F. Robertson

MEASUREMENTS OF ERYTHEMALLY EFFECTIVE ULTRAVIOLET RADIATION AND TOTAL OZONE CONTENT. *Nature (London), 258(5530):68-69, Nov. 6, 1975. 8 refs.*

A preliminary analysis of measurements of erythemally effective ultraviolet radiation, wavelengths between 290 and 320 nm, at Aspendale and Brisbane is given. The analysis was performed for cloudless days only, and these days were selected from continuous records of global and diffuse short wave radiation at Aspendale, and from visual reports of cloud cover at Brisbane. The daily maximum half hourly total of ultraviolet radiation was plotted against time. Graphs were also plotted of the mean annual variation of total ozone content, from 18 years of data for both Aspendale and Brisbane. The departures of both total ozone content and the noon ultraviolet irradiance from their mean values, were then expressed as percentages, and plotted against each other. Measured and calculated dependences are compared. There is excellent agreement between the measured and calculated values for the Aspendale 1966 to 1970 data. The other three periods of measurement give less satisfactory agreement, presumably because of the limited amount of data.

60625 **APTIC NO. 82617**

Berman, Neil S. and Kenyon G. De Laney

ATMOSPHERIC MODELING FOR PHOENIX, ARIZONA. *Arizona State Univ., Tempe, Rept. ERC-R-75009, 54p., May 1975. 5 refs.*

A multiple box model for predicting carbon monoxide concentrations in the greater Phoenix, Arizona area is described. Changes from a preliminary version of the model are discussed and the results for a typical winter day during the 1974-75 season are presented. The box model was selected to minimize computer time, to allow changes to be easily made, and because the input and output formats could be used for future analysis. A complex spatial variation of the wind within the Phoenix area precludes using a Gaussian plume model with only a single wind for the entire area. Since the box model can account for changes in the wind, predictions of CO concentrations for projected automobile traffic, new freeways, housing developments, and urban transit can be made easily for outlying areas. The box model gives excellent results in the simulation of a nonreacting contaminant in the Phoenix area. (Author abstract modified)

60626 **APTIC NO. 76337**

Bidleman, T. F. and C. E. Olney

LONG RANGE TRANSPORT OF TOXAPHENE INSECTICIDE IN THE ATMOSPHERE OF THE WESTERN NORTH ATLANTIC. *Nature (London), 257(5527):475-477, Oct. 9, 1975. 13 refs.*

During 1973-1974, 36 air samples were collected on the south shore of Bermuda and 20 from the bow of the RV Trident on cruises in the western North Atlantic. Toxaphene was identified by electron capture gas chromatography. The majority of the toxaphene in the air did not originate from Bermuda. The mean toxaphene concentration in the 56 samples was 0.63, as against 0.024 for p, p prime-DDT. The ratio of these concentrations is close to the ratio of the outdoor evaporation rates of the two pesticides. A possible source of airborne toxaphene is the southern United States cotton growing areas, where the bulk of this pesticide is used in combination with DDT or methyl parathion.

60627 **APTIC NO. 83740**

Boeger, Peter

GLOBAL VIEW OF PHOTOSYNTHESIS. *(Photosynthese in globaler Sicht). Text in German. Naturw. Rundschau, 28(12):429-435, 1975. 48 refs.*

The extent to which solar energy falls on the earth and its uses in photosynthsis in land and sea plants are reviewed. Only about 45% of the sun s rays directed toward the earth are absorbed at the surface. On land only 0.3%, and in the ocean only 0.07%, of light energy is converted into chemical energy by photosynthesis. Present world-wide food production, sufficient to feed 5.6 people at one million kcal per person per year, is only 1.3% of the total photosynthesis taking place on dry land. With more intensive agriculture and optimal use of photosynthesis, it has been estimated that a world population of 1000 billion would be possible. Early terrestial history included a long period when the earth had a reducing atmosphere consisting of hydrogen, methane, ammonia, and water, but without carbon dioxide. As H2 diffused away from the earth, CO2, nitrogen, and eventually some oxygen were formed by chemical reactions. During the period of reducing atmospheric conditions, there was an abiotic synthesis of organic substances, and the origin of primitive organisms. This led to CO2 enrichment of the air. Then photosynthesis was possible, and has been going on for 3.5 billion years, during which time O2 concentration in the atmosphere rose from almost zero to its present value. The O2/CO2 cycles are present in both the ocean and in the land-atmosphere combination. About 5% of the CO2 in air takes part in photosynthesis yearly so that CO2 is completely renewed every 20 years. Renewing of O2 in the atmosphere by photosynthesis requires 13,000 years. The oceans contain 50 times as much as CO2 as the atmosphere, and only a very small part of it is consumed annually in photosynthesis. Technology accounts for 12.3% of the yearly CO2 production, and as a result CO2 concentration in the atmosphere is increasing at the rate of 0.7 ppm per year. This in turn has an effect on weather and climate by the so-called greenhouse effect.

60628 **APTIC NO. 83014**

Bogen, J.

RADON-222 MEASUREMENTS ABOARD AN AIRPLANE FOR THE DESCRIPTION OF ATMOSPHERIC DIFFUSION. *In: Noble Gases. Richard E. Stanley, A. Alan Moghissi, and Jerry J. Lorenz (eds.), p. 544-560, 1975. 11 refs. (Presented at the Noble Gases Symposium, Las Vegas, Nev., Sept. 24-28, 1973.)*

Radon 222 is a natural tracer in the troposphere due to its long half-life. A method is described by which Radon 222 was absorbed aboard an airplane in tubes filled with 50 g of charcoal and cooled by carbon dioxide and freon. The tubes were evacuated after air collection at different heights up to 5 km, and heated in the laboratory for desorption of the gas molecules and for transfer into a decay chamber covered with zinc-sulfide serving as a scintillator for the detection of alpha activity from Rn-222 and its daughters. This method was used to determine Rn 222 height profiles in the area of Heidelberg. Basic relationships of the eddy diffusion theory were used for interpretation of the results, and for determination of the vertical diffusion coefficient. The measurements generally showed an exponential decrease in concentration up to 5 km in height, if there was no cloud layer. The height for a reduction by a factor of two was about 900 m. The measurements yielded a constant diffusion coefficient of approximately 3.7 times 10 to the 4th power sq cm/sec. A decrease in concentration was observed for flights in stratiform clouds up to a certain height; then radon 222 increased again or remained constant. This was probably due to meteorological conditions. (Author abstract modified)

60629 **APTIC NO. 83498**

Bourelly, T.

STRONG ACID POLLUTION MONITORING AT THE TOP OF TOURS DU FRONT DE SEINE TOWERS NEAR THE HEATING PLANT OF THE PARIS URBAN HEATING PLANT. THIRD MEASUREMENT SERIES (10/1/73 TO 12/31/74). *(Etude de la pollution atmospherique en acidite forte au sommet des Tours du Front de Seine voisines de la chaufferie de la compagnie* *parisienne de chauffage urbain. Troisieme campagne (1.10.73/31.12.74)). Text in French. Pollut. Atmos. (Paris), 17(67):213-227, July-Sept. 1975.*

The results of a 3-year semi-hourly measurement study indicate that the emission patterns from the Grenelles heating plant chimney are not related to the variations in pollution recorded at Tour du Front, Tour de l Evasion, and Tour de l Ingenieur Keller. The latter variations are produced by meteorological phenomena. Semi-hourly measurements of pollutants of over 500 microgram/cu m at Tour du Front show that a peak is reached at 9 am and is very marked; it cannot be solely explained in terms of an increased energy consumption from 6 to 9 am since the peak is present on Sundays. The peak is due to almost daily temperature inversions from 6 to 9 am and to winds weaker during the night than the day. The analysis of peaks of over 1000 microgram/cu m over 3 years indicates that they are very sensitive to slight variations in meteorological parameters. The soil temperature increased as a pollution peak formed and decreased a few hours before the peak. Hourly increases in pollution were found capable of exceeding 200 microgram/cu m around the plant; however, such values are found at comparable intensities in other sections of Paris.

60630 **APTIC NO. 82651**

Braham, Roscoe R., Jr.

OVERVIEW OF URBAN CLIMATE. *Preprint, Chicago Univ., Chicago, Ill., Dept. of the Geophysical Sciences, 36p., Sept. 15, 1975. 25 refs.*

Recent data from the Metropolitan Meteorological Experiment (METROMEX) in the St. Louis area are combined with data from prior studies to analyze the broad features of urban climate anomalies. Urban effects on rainfall appear to be primarily associated with cloud dynamical effects which are in turn associated with the heat island effect and surface roughness. Cloud microphysical effects associated with urban derived nuclei and aerosol particles as well as the development of haze are probably of less importance in explaining rain anomalies unless there are feedback processes not yet explored.

60631 **APTIC NO. 81530**

Briggs, Gary A.

PLUME RISE PREDICTIONS. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. 75/15, 56p., June 1975. 179 refs. (Presented at the American Meteorological Society Workshop on Meteorology and Environment Assessment, Boston, Mass., Sept. 29-Oct. 3, 1975.)*

Models for predicting plume rise are discussed. Topics covered include: the physics of plume rise; rise near the source; and the limitation of plume rise as a result of stable stratification, mechanical turbulence, and convective turbulence. In addition to methods for predicting the rise of dry plumes, an appendix dealing with modeling of cooling tower plumes is also presented. The models used throughout the presentation are similar to past models but are extended somewhat and employ conservation equations which are more carefully derived.

60632 **APTIC NO. 82616**

Briggs, Gary A.

RESEARCH REQUIRED FOR PREDICTING THE BEHAVIOR OF PRESSURIZED GASES ESCAPING INTO THE ATMOSPHERE. *Preprint, National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., 27p., 1975. 8 refs.*

The prediction of the behavior of pressurized gases accidentally released into the atmosphere require many considerations, among which are thermodynamics, momentum, positive and negative buoyancy, entrainment, and ambient wind and temperature structure. Gases under high pressure expand when released into the atmosphere, so there is a possibility of cooling, which can greatly affect subsequent behavior of the gas. There may be significant heat transfer from the container to the gas. The manner in which the temperature and rate of release of the escaping gas change with time must be known to define the source strength and the basic character of the source. Diffusion of jets is discussed. The possible initial source configurations, the point at which the plume or cloud behaves more as a light gas or a dense gas, and the dilution at the end of the momentum-dominated stage are all relevant factors. Buoyant plumes from point sources are discussed mathematically. A plume may not have enough buoyancy or vertical momentum to lift off the ground. If it does, its configuration may resemble either that of a point source or that of a line source. The more complex behavior of dense gases is also discussed. Releases of dense gases may approximate more than one source type. The initial dilution of the gas also affects its behavior. Several stages of behavior must be considered. The point at which a dense gas becomes passive, diffusing like a nonbuoyant gas, is important.

60633 **APTIC NO. 82641**

Brosset, Cyrill

THE ACIDIFICATION OF RAIN THROUGH THE CATALYTIC OXIDATION OF SULPHUR DIOXIDE. *Swedish Water and Air Pollution Research Lab., Gothenburg (Sweden), Rept. B 252, 34p., Oct. 1975. 6 refs.*

A model for the oxidation of sulfur dioxide in aqueous solution is proposed in connection with the acidification effect of sulfur dioxide on rain. The model is based on the assumption that a catalytic ion and hydrogen sulfite ions form a sparingly soluble solid phase which is oxidized by oxygen as soon as it is precipitated, resulting in the formation of sulfate ions and the dissolution of the solid phase. The model forms the basis of equilibrium calculations which explain observations related to the wet deposition of sulfate resulting from sulfur dioxide emissions.

60634 **APTIC NO. 80204**

Brun, Edmond A.

MASS TRANSPORT IN THE STRATOSPHERE. *(Les phenomenes de transport de masse dans la stratosphere). Text in French. Intern. J. Heat Mass Transfer), 18(6):731-735, June 1975. 3 refs.*

Mass transport in the stratosphere was investigated. Experiments are described on the mechanisms by which the low stratosphere pollutants are transported up to a higher altitude.

60635 **APTIC NO. 80327**

Brutsaert, Wilfried

ON A DERIVABLE FORMULA FOR LONG-WAVE RADIATION FROM CLEAR SKIES. *Water Resour. Res., 11(5):742-744, Oct. 1975. 16 refs.*

A derivation is presented for the effective atmospheric emissivity to predict downcoming long wave radiation at ground level under a clear sky and for a nearly standard atmosphere. The results are in good agreement with those obtainable with empirical formulae based on water vapor pressure and temperature. The proposed formulation is based on physical grounds without the need for empirical parameters from radiation measurements. It may be adjusted in a simple way to reflect changes in climatic and atmospheric conditions. (Author abstract modified)

60636 **APTIC NO. 84440**

Bryson, Reid A. and Wayne M. Wendland

CLIMATIC EFFECTS OF ATMOSPHERIC POLLUTION. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 139-147. 34 refs.*

Trends in world temperature related to atmospheric carbon dioxide and dust (turbidity) are reviewed. Since 1940, the warming attributed to increasing concentrations of CO2 has apparently been more than equalled by the cooling effect of increased atmospheric dust loading. Increased turbidity also appears to be affecting the meridional radiation gradient and thus the thermal Rossby number and circulation patterns. A reduction in the meridional radiation as a result of increased turbidity appears to be responsible for a weakening of the westerlies observed during the 1960 s.

60637 APTIC NO. 83347

Burgmeier, James W. and Irvin H. Blifford, Jr.

A REINFORCED COAGULATION-SEDIMENTATION MODEL FOR STRATOSPHERIC AEROSOLS. *Water, Air, Soil Pollut., 5(2):133-147, Dec. 1975. 8 refs.*

A numerical model was constructed to simulate the aging of the aerosol size distributions in the stratosphere in the presence of sources, and to calculate mean residence times in the absence of sources. This model and one for the troposphere assume quasi-steady conditions and do not include air motions. Although it is recognized that ultimately the microphysics of aerosol interactions must be combined with advection in order to construct a realistic model of atmospheric aerosol behavior, the computation is beyond present capabilities. The stratospheric model incorporates the mechanisms of thermal coagulation, gravitation sedimentation, and gas reactions. An upper limit for the stratospheric production rate of reacting gas is estimated at 10 to the -20th g/cu cm/s.

60638 APTIC NO. 79615

Cagnetti, P.

DOWNWIND CONCENTRATIONS OF AN AIRBORNE TRACER RELEASED IN THE NEIGHBOURHOOD OF A BUILDING. *Atmos. Environ., 9(8):739-747, Aug. 1975. 4 refs.*

A series of nine atmospheric diffusion experiments was carried out to investigate the effect of the wake induced by a building on the downwind concentrations of an airborne aerosol release. A uranine dye aerosol was used as a tracer during unstable conditions, generally characterized by the presence of a sea breeze. The tracer was released about 100 m upwind of a building of about 1600 sq m cross sectional area. Five experiments used a network of 22 sampling points around the building for sampling times of 1 hr, 0.5, hr, and 0.25 hr. The other four experiments were based on a network of 20 sampling points distributed over two crosswind lines, at 450 and 850 m from the release point. No significant correlation of downwind airborne concentrations with wind velocity in front of the building was found. While the crosswind peak concentration upwind of the building is clearly a function of the sampling time, this is not the case of 450 and 850 m downwind. The turbulence induced by the building was sufficient to homogenize the concentraton at those distances. The additional dilution induced by the building reduced the values of air concentration by a factor of 4 at 300 m, of 2 at 550 m, and probably had no effect at about 1000 m from the release point. (Author abstract modified)

60639 APTIC NO. 76370

Cannon, Theodore W.

A PHOTOGRAPHIC TECHNIQUE FOR MEASUREMENTS OF ATMOSPHERIC PARTICLES IN SITU FROM AIRCRAFT. *J. Appl. Meteorol., 14(7):1383-1388, Oct. 1975. 4 refs.*

A camera was used to take in situ photographs of cloud droplets, raindrops, and ice particles from a sailplane during flights through developing cumulus clouds, wave clouds, and precipitation. At lens magnification M equals 1X, images of particles of 4 micron radius and larger are recorded by the camera. The largest images are limited by the 24 mm times 36 mm projected area photographed. Out-of-focus as well as in-focus images are used for ice particle and raindrop size and concentration measurements. Ice particle shapes are determined from their in-focus images. Droplet concentrations are measured by either counting the number of images photographed within a predetermined sample volume or by measuring the overall fog level of the photographic negatives. Liquid particles can be distinguished from ice particles if their radii exceed about 50 micron.

60640 APTIC NO. 76466

Carlson, Diane M. H.

COMPARISON OF SULFUR DIOXIDE AIR QUALITY DATA WITH THE PALSEM MODEL. *Georgia Inst. of Technology, Thesis (M.S. in Chemical Engineering), Aug. 1975, 111p. 12 refs.*

The Point, Area, and Line Source Emission Model (PALSEM), one of many dispersion models available to predict the effect of single and multiple emission sources on air quality, was studied. Sulfur dioxide air quality data collected downwind from a pulverized coal fired power plant were compared with short term and hourly ground level concentrations computed using boiler operating data, meteorological information, and the PALSEM program. The boiler data and meteorological information were transformed to emission rates and stability wind roses for use in the PALSEM program. The frequency distribution, annual arithmetic mean, geometric mean, geometric standard deviation, and 1-hour maximum were determined for the hourly air quality data and compared with the PALSEM predictions. Comparison of predicted and measured average concentrations and frequency distributions show that the model did not accurately predict either one. Better correspondence of measured and predicted averages would have been achieved by rotating the wind direction clockwise 22.5 deg. Possibly a direction shift occurred between the winds measured at the meteorological tower and the actual transport winds. Since the power plant was northwest of the monitoring sites, measured concentrations would be expected only during winds at or near a northwest direction. While northwest was the predominant direction for nonzero concentrations, measured values, some as high as 500 microgram/cu m, occurred under virtually all wind directions. Either SO2 reached the monitors from the power plant through some indirect route during periods of changing winds, or significant interference effects produced occasional high readings, even in the absence of SO2 from the power plant plume. Recommendations are given to allow the model to be calibrated to minimize these effects. (Author abstract modified)

60641 APTIC NO. 76374

Casanova, J. and C. Duenas

INFLUENCE OF WASHOUT AND SETTLING OF AEROSOLS ON THE VERTICAL DIFFUSION COEFFICIENTS. *(Efectos de lavado y deposito de aerosoles en los coeficientes verticales de difusion). Text in Spanish. An. Fis., 71(3):226-233, July-Sept. 1975. 9 refs.*

The coefficient of vertical turbulent exchange near the ground was investigated, and calculated using experimental data on radon concentration at different heights. Radon is found indirectly by means of collected aerosols in which its solid short lived daughters are deposited. These radon daughters are in radioactive equilibrium with the same radon. The coefficient is related to the measure of radon by the diffusion equation for turbulence. The influence of washout effects and deposition velocity of the aerosols was studied. The effect of a modified radioactive equilibrium between radon and its daughters on the model coefficient was determined.

60642 APTIC NO. 82845

Chiba, Shozo

DISPERSION PHENOMENON OF POLLUTANTS NEAR EMISSION SOURCE. *(Hasseigen kinbo ni okeru osenbusshitsu no kakusan gensho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):302,* *1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 186.)*

An empirical diffusion equation for pollutants in the vicinity of an emission source reported previously was evaluated, and a theoretical diffusion equation with meteorological factors was derived. As a pollutant source, an animal farm with no diffusion obstacles in the surrounding area was selected, and ammonia concentration, wind direction, and wind velocity were measured. The concentration distribution to the leeward at stable wind direction and unstable wind direction, the relative concentration distribution, and empirical equations were obtained (correlation coefficient 0.90-0.96, diffusion coefficient 5.9-11 sq m/s). Descriptions of a theoretical derivation method for a diffusion equation, based on the substance mobility theory, are given. The results indicate that the empirical equations can also be obtained by theoretical derivation.

60643 **APTIC NO. 82925**

Chisaka, Fumitake, Shigeru Yanagihara, and Isamu Shimada

NUMERICAL ANALYSIS OF PHOTOCHEMICAL SMOG. *(Kokagaku hannoseibutsu no densanki shimureishion. 3). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):300, 1975. 2 refs. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 184.)*

The estimation of the pollutant concentration produced by photochemical reactions and a clarification of the formation mechanism behind high pollutant concentrations are important in pollution control. A reaction model for simulating a wide range of photochemical reactions was developed, and the effects of emission quantity, dilution phenomenon, and insolation intensity were evaluated using simple functional models. In order to investigate the effect of various factors, calculations were carried out by varying 1) the emission ratio of hydrocarbon (propylene) and nitrogen oxides (nitric oxide 90%, nitrogen dioxide 10%), 2) the insolation intensity, 3) a regional emission, rate 4) traffic volume, and 5) the dilution rate.

60644 **APTIC NO. 79594**

Cicerone, Ralph J.

COMMENT ON VOLCANIC EMISSIONS OF HALIDES AND SULFUR COMPOUNDS TO THE TROPOSPHERE AND STRATOSPHERE BY R. D. CADLE. *J. Geophys. Res., 80(27):3911-3912, Sept. 20, 1975. 15 refs.*

Tropospheric sources of stratospheric chlorine atoms are discussed. The major natural source of stratospheric ClX, at least in periods when explosive volcanoes are quiet, are from methyl chloride produced at ground level. A range of values was calculated from CH3Cl ground level mixing ratios (vol/vol) of 4 times 10 to the -10th power up to 2 times 10 to the -9th power and from model concentrations of hydroxide. Tropospheric scavenging of hydrogen chloride by liquid and solid phase water controls the altitude profile of HCl in most of the troposphere. The conversion of sea salt aerosol to HCl provides little ClX to the troposphere. Volcanoes eject HCl and Cl2 into the stratosphere. The magnitude of this source is estimated at 243 million metric tons/yr.

60645 **APTIC NO. 82586**

Cleveland, William S, Beat Kleiner, Jean E. McRae, and Jack L. Warner

THE ANALYSIS OF GROUND-LEVEL OZONE DATA FROM NEW JERSEY, NEW YORK, CONNECTICUT, AND MASSACHUSETTS: TRANSPORT FROM THE NEW YORK CITY METROPOLITAN AREA. *Preprint, Bell Labs., Murray Hill, N. J., 67p., 1975. 16 refs.*

The transport of photochemical air pollution in the northeastern United States was studied by analyzing hourly ground level ozone concentrations at 32 sites, meteorological data at eight sites, and air parcel trajectories in eastern New York, northern New Jersey, Connecticut, and Massachusetts from May to September of 1974. Photochemical air pollution resulting from primary emissions in the New York City metropolitan area appeared to be transported by prevailing winds on a 300-kilometer northeast trajectory through Connecticut and as far as northeastern Massachusetts. This resulted in southwestern Connecticut having the highest ozone concentrations in the region. A substantial increase in ozone concentrations was also observed in Massachusetts. Air entering the New York City metropolitan area was often above the Federal standard of 0.08 ppm, although the concentration distribution was well below the concentration distributions at downwind sites in Connecticut. (Author abstract modified)

60646 **APTIC NO. 83034**

Cleveland, William S. and Beat Kleiner

THE TRANSPORT OF PHOTOCHEMICAL AIR POLLUTION FROM THE CAMDEN-PHILADELPHIA URBAN COMPLEX. *Preprint, Bell Labs., Murray Hill, N. J., 18p., 1975 (?). 9 refs.*

A graphical statistical technique is used to demonstrate the transport of photochemical air pollution from the Camden-Philadelphia urban complex Ozone concentrations at each of four sites in New Jersey and Pennsylvania which range from 27-49 km from the center of the Camden-Philadelphia urban complex are higher when the air is flowing from the complex to the site. This accounts for some of the ozone previously observed in the nonindustrial, low traffic density area of Ancora, New Jersey where concentrations of primary pollutants are low but where ozone daily maxima frequently exceed the Federal standard. Thus photochemical air pollution in this area is a regional rather than a local phenomenon. (Author abstract modified)

60647 **APTIC NO. 80095**

Cline, J. D. and I. R. Kaplan

ISOTOPIC FRACTIONATION OF DISSOLVED NITRATE DURING DENITRIFICATION IN THE EASTERN TROPICAL NORTH PACIFIC OCEAN. *Mar. Chem., 3(4):271-299, Nov. 1975. 50 refs.*

The isotopic composition of dissolved nitrate was measured at five stations within the oxygen deficient region of the eastern tropical North Pacific Ocean (ETNP) and at one station 900 km northeast of Hawaii. At this station the isotopic composition of dissolved nitrate decreased systematically from about +6% at 400 m to approximately +5% at 5000 m. These results are consistent with other estimates from the western Pacific. Vertical profiles of isotopic composition of dissolved nitrate from the ETNP correlated with the losses of nitrate arising from denitrification. Instantaneous fractionation factors were estimated using the one dimensional vertical diffusion advection model. The isotope 14NO3(-) is consumed 3-4% faster than 15NO3(-), significantly larger than fractionations (less than or equal to 2%) observed under laboratory conditions. Maximum rates of denitrification at 100 m ranged from 0.6 to 8 microgram at 1 to the -1st power/yr. (Author abstract modified)

60648 **APTIC NO. 80016**

Conte, C. and G. Devitofrancesco

TRACER DIFFUSION STUDY OF A PUNCTIFORM EMISSION SOURCE. *(Prove di diffusione da sorgente puntiforme mediante un tracciante). Text in Italian. Inquinamento, no. 2:9-11, Feb. 16, 1975. 7 refs.*

Mean concentrations and ranges of maximum concentration, measured at various altitudes and sampled at various distances from a point source with a gas tracer, sulfuric hexafluoride, were compared to theoretical concentrations and distances obtained with the formulas of Bosanquet-Pearson, Sutton, and Pasquill. For low altitudes (10 to 18 m) the smallest deviations were obtained with the Pasquill formula while a minimum deviation was obtained (for 30 m) with the Sutton formula. For distances of maximum concentrations, intermediate values were found between those obtained with the Bosanquet-Pearson and the Sutton formulas; a significant discrepancy was obtained for the 10 m measurement; it can be explained by the fact that the cloud of smoke takes the shape of a cone which expands as it drifts away from its source because of the expansion of the vortices. The adequate correspondence of data obtained for short distances with the Pasquill formula is due to a high degree of correlation, as diffusion begins, between the initial and the successive movements of 2 gas columns. The greatest difficulty lies in determining the parameters which characterize local climates.

60649 **APTIC NO. 80153**

Counihan, J.

ADIABATIC ATMOSPHERIC BOUNDARY LAYERS: A REVIEW AND ANALYSIS OF DATA FROM THE PERIOD 1880-1972. *Atmos. Environ., 9(10): 871-905, Oct. 1975. 579 refs.*

A review and analysis of the meteorological literature on fully developed adiabatic boundary layers is presented. Many inconsistencies exist in earlier presentations and reviews, particularly with respect to quantifying the power indices and turbulence intensities appropriate to rougher terrains and the variation of the turbulence length scales with height and terrain type. These are resolved by defining from the data four distinct terrain types: smooth including ice, mud snow, sea; moderately rough, including short grass, grass/crops, rural; rough, including rural/woods, woods, suburbs; and very rough, including urban. The variation of the power index, turbulence intensity, and Reynolds stresses with these terrain types follows the same law. The longitudinal length of scale of turbulence decreases with increase of terrain roughness. A simple law is proposed for its variation with both height and terrain type. (Author abstract modified)

60650 **APTIC NO. 79734**

Cox, R. A., A. E. J. Eggleton, R. G. Derwent, J. E. Lovelock, and D. H. Pack

LONG-RANGE TRANSPORT OF PHOTOCHEMICAL OZONE IN NORTH-WESTERN EUROPE. *Nature (London), 255(5504):118-121, May 8, 1975. 8 refs.*

The long-range transport of photochemical ozone in north western Europe is discussed. Concentrations of O3 were measured at three sites in southern Britain. Incidents of elevated O3 concentration superimposed on a background level are clearly indicated at each site. This background level represents the natural O3 content of the lower troposphere over north western Europe. The general pattern of the fluorocarbon concentrations is very similar to the maximum hourly mean O3 concentration data. Values vary in southern England but stay near background level for longer periods at Agrigole, Ireland. In suitable meteorological conditions measurable amounts of photochemical pollution of anthropogenic origin are transported over distances up to 1000 km in north western Europe. Continental emissions provide a major contribution to photochemical pollution in the United Kingdom.

60651 **APTIC NO. 83006**

Craig, Richard A., Joost A. Businger, Richard D. Cadle, Robert J. Charlson, James P. Friend, John E. Geisler, Donald M. Hunten, and John W. Winchester

ATMOSPHERIC CHEMISTRY: PROBLEMS AND SCOPE. *National Research Council, Washington, D. C., Panel on Atmospheric Chemistry, National Oceanic and Atmospheric Administration and National Science Foundation Contract NSF-C310, Task 9, 130p., 1975. 197 refs.*

Atmospheric chemistry deals with the effects of chemical and meteorological processes on the composition of the atmosphere, including both gaseous and particulate components, both naturally occurring and of human origin. Though occurring in small amounts, trace gases may influence precipitation, incoming solar radiation, and urban visibility and air quality, and some interact with animal and plant life. To understand the trace constituent cycles and how human activities affect them is atmospheric chemistry s central problem. Too little attention is being devoted to identifying potential problems, which are apt to arise in four general areas: urban air quality, stratospheric composition, migration and fate of atmospheric trace substances, and climate change. Atmospheric chemistry s role in the urban air quality problem is understanding the subsequent atmospheric transport and chemical transformation of the substance emitted. Its role in the stratospheric problem is to understand the possible effect of human activities on ozone and stratospheric particles, considering both atmospheric transport and chemical transformation. Atmospheric chemistry must also understand trace substances natural cycle and the possible effects of human activities. The problem of climatic change draws on atmospheric chemistry for knowledge of the optical properties of trace substances that might affect radiation balance. Scientific manpower and existing educational programs in atmospheric chemistry are limited. Several specific recommendations related to implementing such programs are presented. (Author abstract modified)

60652 **APTIC NO. 82762**

Culkowski, Walter M.

STANDARD DEVIATION OF WIND DIRECTION AS A FUNCTION OF TIME; THREE HOURS TO FIVE HUNDRED SEVENTY-SIX HOURS. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. 75/11, 9p., July 1975. 7 refs.*

Wind data from Oak Ridge, Tennessee were used to calculate the standard deviation of wind direction as a function of time and in turn the average maximum concentration of an effluent plume from a continuous point source. The average standard deviation of the horizontal wind direction was averaged over periods ranging from 3-576 hr. The average maximum effluent concentration from a continuous point source was found to be proportional to the -0.28 power of the time for averaging times from 3-100 hr and to the -1 power of the natural logarithm of time for averaging times up to 1000 hr.

60653 **APTIC NO. 82640**

Dabberdt, Walter F.

MULTIPLE-TRACER HIGHWAY DISPERSION STUDY. *Preprint, Stanford Research Inst., Menlo Park, Calif., Atmospheric Sciences Lab., 9p., 1975. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Multiple tracer dispersion experiments were conducted on a straight, level, at-grade section of a six-lane highway to investigate the interactive role played by traffic, meteorology, and roadway configuration on air flow and air quality near roadways. The ratio of the diffusion parameter for the trace gas released from upwind lanes to that released in the downwind lanes for each test ranged over an order of magnitude from about 0.3-3.0. Variations in the ratio were examined against corresponding changes in ambient meteorological conditions and traffic parameters. The highest correlation (-0.35) was found with wind speed alone. Correlations with traffic parameters were generally less than 0.2. Individual diffusion values correlated well with the ratio of the standard deviation of vertical wind fluctuations to wind speed. Inclusion of traffic volume in the ratio did not change the correlation. Tracer release and concentration data were used with carbon monoxide concentration data to compute the CO emission rate of the mix of vehicles on the highway, and the computed values ranged up to 0.03 g/m/sec for each traffic stream. Corresponding emission values were computed from a cruise-mode emission model. The ratio of tracer to model values was 1.015, while the average normalized difference between the two methods was 35%. (Author summary modified)

60654 **APTIC NO. 76333**

Dana, M. Terry, Jeremy M. Hales, and M. A. Wolf

RAIN SCAVENGING OF SO2 AND SULFATE FROM POWER PLANT PLUMES. *J. Geophys. Res., 80(30):4119-4129, Oct. 20, 1975. 18 refs.*

A model for prediction of the reversible washout of sulfur dioxide emitted from power plant plumes and other sources was developed. Predictions of this computer code model compare favorably with washout measurements made during a number of controlled source experiments and four power plant experiments. Negative washout occurs as a result of desorption of SO2 from the rain below the SO2 plume. The rate of deposition of sulfate is 1-5 times greater than that of SO2 at distances from 0.4 to 11 km from the stack. The experimental results are applied to two very simple SO2 oxidation models: one involving liquid phase (raindrop) oxidation and one considering plume oxidation. Either mechanism is compatible with the observations if the SO2-sulfate reaction half time in each case is of the order of 0.07 hr. (Author abstract modified)

60655 **APTIC NO. 82583**

Davidson, C. I., S. V. Hering, and S. K. Friedlander

THE DEPOSITION OF PB-CONTAINING PARTICLES FROM THE LOS ANGELES ATMOSPHERE. *Preprint, California Inst. of Tech., Pasadena, W. M. Keck Labs., 4p., 1975. 17 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Calculations based on size distribution measurements of lead-containing particles in the Los Angeles atmosphere indicate that the deposition of Pb is controlled by sedimentation. Even though 86% of the receptor mass is in particles smaller than 10 micron, these particles do not play a significant role in the deposition process. The calculations apply only to smooth surfaces. A higher rate of deposition is expected for rough surfaces where impaction on roughness elements becomes important since large particles influenced by gravity are also efficiently deposited by impaction. Once large particles with short atmospheric residence times are deposited near urban areas, smaller and more stable material may remain airborne for considerable periods of time. (Author conclusions modified)

60656 **APTIC NO. 76442**

De Krasinski, J. S. and T. Van Hardeveld

TESTS ON A WIND TUNNEL MODEL WITH TEMPERATURE GRADIENT IN A SIMULATED ATMOSPHERIC SHEAR LAYER. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 349-360. 5 refs. (Feb. 17-21.)*

A wind tunnel model that accounts for temperature differences between indoor and outdoor atmospheres where air conditioning is standard equipment is described. The atmospheric boundary layer develops along a closed rectangular channel with a length-to-height ratio of 15. Air is drawn from the atmosphere into a chamber where it starts mixing with indoor air; both intakes are varied at will. The boundary layer with the temperature gradient reaches approximately half of the height of the working section. Velocity and turbulence profiles and turbulence spectra can be varied by varying the roughness of the floor. (Author abstract modified)

60657 **APTIC NO. 83922**

Deirmendjian, D.

FAR INFRARED AND SUBMILLIMETER WAVE ATTENUATION BY CLOUDS AND RAIN. *J. Appl. Meteorol., 14(8):1584-1593, Dec. 1975. 37 refs.*

Optical constants for water at far infrared and submillimeter wavelength were used to estimate water cloud and rain attenuation over the wavelength range between lambda 12 micron and lambda 2 cm. New analytical drop size distribution models simulating fog, nimbostratus cloud and rain, corresponding to rainfall rates of 10 and 50 mm/hr are set up. The corresponding volume extinction and absorption coefficients as computed according to polydisperse Mie scattering theory at specific wavelengths are listed in tables and presented graphically in plots. Cloud extinction exceeds 50 neper/km in the lambda greater than 100 micron region, whereas for wavelengths longer than lambda 200 micron, under near saturated conditions, water vapor absorption is the dominant attenuator. The greatest attenuation by heavy rain is lambda 5 mm with a value of 5 neper/km. In the presence of nonprecipitating water clouds or fog there is a relative transmission window centered around lambda 1.3 mm. (Author abstract modified)

60658 **APTIC NO. 84121**

Demidowicz, Gustaw

SOLAR RADIATION TRANSMISSION THROUGH THE FLUE GAS PLUME OF THE POWER PLANT STACKS AT PULAWY, POLAND. *(Transmisja promieniowania slonecznego przez smuge zanieczyszczen z komina elektrocieplowni w Pulawach). Text in Polish. Ochrona Powietrza (Warsaw), 2(46):48-50, March-April 1975. 3 refs.*

Changes of solar radiation transmission through pollutants originating in the chimney of a coal-fueled heating nd electric power plant were studied. Direct measurements of the radiation were performed with a thermoelectric actinometer for the long-wave spectrum (lambda more than 625 m) using an RG filter. The differences measurements determined the radiation in the short-wave portion of the spectrum (lambda less than 625 m). A total of 45 readings were carried out through the pollution plume at different distances from the emission source for the entire spectrum and its long-wave segment with and without a filter on sunny, cloudless days. Despite similar weather conditions, the results showed a considerable variability related to the natural variability of the plume. The relationship between the average solar radiation transmission through the pollutant plume from a high point source and the distance from the latter could be expressed by a linear equation with 2 empirical parameters. It was established that pollutants derived from coal burning weakened short-wave solar radiation over a longer distance than long-wave radiation. Simultaneously, extinction of solar radiation through the pollutant plume could be observed at a distance about 3 times farther away in the short-wave spectrum than in the long-wave end.

60659 **APTIC NO. 81452**

Dickinson, Robert E.

SOLAR VARIABILITY AND THE LOW ATMOSPHERE. *Bull. Am. Meteorol. Soc., 56(12):1240-1248, Dec. 1975. 40 refs.*

Possible mechanisms connecting solar activity to the meteorology of the lower atmosphere are reviewed. Solar-related fluctuations associated with cloudiness are discussed; and variations in cloudiness are related to variations in the production of ionization near the tropopause by galactic cosmic rays, the only geophysical phenomena unconnected with upper atmospheric processes which are known to possess a negative correlation with solar activity. Such a connection possibly involves a dependence of sulfate aerosol formation on ionization and in turn a dependence of cloud radiative properties on variations of the aerosol particles action as cloud condensation nuclei. (Author abstract modified)

60660 **APTIC NO. 76426**

Ehhalt, D. H., L. E. Heidt, R. H. Lueb, and W. Pollock

THE VERTICAL DISTRIBUTION OF TRACE GASES IN THE STRATOSPHERE. *Pure Appl. Geophys. (Basel), 113(3):389-402, 1975. 19 refs.*

New measurements on the stratospheric distribution of hydrogen, methane, carbon monoxide, and nitrous oxide are presented and used to demonstrate the natural variability of the trace gas concentrations. Present and previous CH4 and H2 measurements are combined to give average vertical profiles. These profiles are compared with water vapor data to see if the vertical decrease in CH4 is matched by a corresponding increase in H2O. Profiles of the vertical eddy diffusion coefficient (kz) are deduced by comparing the average measured profiles to those predicted by a one dimensional chemical model. Generally, a barrier in the lower stratosphere and increasing transport in middle and upper stratosphere seem required to match theoretical and experimental profiles. The limitations of the calculated kz are discussed. (Author abstract)

60661 **APTIC NO. 76560**

Endo, Y.

ON THE SUMMER TIME WEATHER AND PHOTOCHEMICAL SMOG IN AICHI PREFECTURE, COMPARISON BETWEEN 1973 AND 1974. *(Kaki no tenko to Aichi-ken no kokagaku sumogu ni tsuite, Showa 48 nen to 49 nen no hikaku). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 8:81-83, Sept. 1975.*

A comparison of photochemical smog incidents during summer in 1974 and 1973 was made in relation to meteorological factors. The number of days for which photochemical smog warnings were in effect in June, July, and August 1973 was 5, 3, and 0 respectively, and that in 1974 was 0, 1, and 1. Due to the extended rainy season in 1974, the temperature in June was not so high as that observed in 1973, and the total amount of rain in the three months was larger in 1974 than 1973. The number of days which had more than 5 hr of sunshine/day was similar between 1973 and 1974, excepting July. July 1973 had 22 days, while July 1974 had 8 days. The SSE to S winds tended to produce higher oxidant levels, and this wind direction occurred more frequently in 1973 and 1974. The presence of either an inversion layer or an isothermal layer in the lower atmosphere affected the frequency of photochemical smog, and these layers appeared more frequently in July 1973 than July 1974.

60662 **APTIC NO. 79735**

Farrow, J. B.

THE INFLUENCE OF THE ATMOSPHERE ON REMOTE SENSING MEASUREMENTS. *Eldo-Cecles/Erso-Cers Sci. Tech. Rev., vol. 7:1-28, 1975. 23 refs.*

The influence of the atmosphere on remote-sensing measurements is discussed. The primary physical processes that influence the propagation of electromagnetic radiation in the atmosphere include: absorption by atmospheric gases, scattering by particles in the atmosphere, and refraction and the effects of refractive-index inhomogeneities associated with turbulence. Other atmospheric processes, such as winds and convective motions evaporation and condensation play an important role in establishing temperature and emissivities of scene elements. Standard atmospheric conditions and variations that can occur in the mean state are described. The influences of the atmosphere on incident and reflected solar radiation and on emitted scene radiation are described with emphasis on the major types of earth resources sensors. Various possible means of correcting atmospherically degraded data are reviewed. (Author abstract modified)

60663 **APTIC NO. 76495**

Fiocco, Giorgio, Gerald Grams, and Guido Visconti

EQUILIBRIUM TEMPERATURES OF SMALL PARTICLES IN THE EARTH S UPPER ATMOSPHERE (50-110 KM). *J. Atmospheric Terrest. Phys., 37(10): 1327-1337, Oct. 1975. 16 refs.*

Equilibrium aerosol temperatures in the earth s upper atmosphere are discussed and results are presented for calculations based on Mie s scattering theory. Aerosols absorb radiation from the solar and planetary radiation fields, exchange sensible heat by collisions with the ambient gas, and emit thermal radiation. Particles acquire a temperature Tp that can be substantially different from the ambient gas temperature Tg. Differences (Tp-Tg) in excess of 100 K are obtained above 60 km in daytime, depending on size, refractive index, and planetary albedo. Negative differences can be obtained at night. The attainment of a high Tp may have important consequences in several atmospheric phenomena, such as the sublimation of alkali metals. (Author abstract)

60664 **APTIC NO. 76375**

Fischer, K. and H. Grassl

ABSORPTION BY AIRBORNE AND DEPOSITED PARTICLES IN THE 8-13 MICROMETER RANGE. *Tellus (Uppsala), 27(5):522-528, 1975. 33 refs.*

The absorption of radiation by natural aerosol particles was measured in the 8-13 micrometer wavelength interval. A comparison was made between an in situ method and measurements of particles of deposited form. The results are in agreement to about 30%. The main feature of aerosol absorption within the infrared window is a strong absorption peak near 9 micrometer caused by sulfate or quartz particles present in all continental aerosol types. Consequences for the atmospheric heat balance are clear sky cooling rates growing from about 2% in the tropics to about 20% of the total cooling in arctic regions under normal conditions, additionally increasing with increasing relative humidity. (Author abstract modified)

60665 **APTIC NO. 76490**

Fitzgerald, James W.

APPROXIMATION FORMULAS FOR THE EQUILIBRIUM SIZE OF AN AEROSOL PARTICLE AS A FUNCTION OF ITS DRY SIZE AND COMPOSITION AND THE AMBIENT RELATIVE HUMIDITY. *J. Appl. Meteorol., 14(6):1044-1049, Sept. 1975. 13 refs.*

Approximations to the exact equations describing the variation with relative humidity of the equilibrium size of aqueous solution droplets were developed. For relative humidities between 81 and 99.5%, and for droplets formed by particles composed of greater than 60% by mass of any one of nine common electrolytes and having a dry radius in the range of 0.05 to 3.0 micron, the approximation formulas presented are accurate to within 5%. An expression was obtained for the size distribution of a chemically homogeneous aerosol as a function of relative humidity. (Author abstract)

60666 **APTIC NO. 84612**

Fujii, Tooru and Kiyoshi Imamura

AIR POLLUTION CAUSED BY PHOTOCHEMICAL REACTION, IV. OCCURRENCE CONDITIONS OF PHOTOCHEMICAL SMOG IN OSAKA, REP. III. *(Kokagaku hanno no yoru taikiosen ni kansuru kenkyu (4). Kokagaku sumogu no hassei joken (111)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):613, 1975. (Presented at Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 345.)*

Occurrences of photochemical smog in Osaka City were studied by measuring the vertical distributions of meteorological factors and nitrogen oxides, ozone, sulfur dioxide, and aerosol concentrations. When a high ozone concentration at a high altitude was transported by a higher altitude wind and the stable layer disappeared, a sufficient convection current was generated to increase the ozone concentration at the ground level.

60667 **APTIC NO. 83514**

Fujitani, Yoshiyasu, Kazuo Ota, Kozo Mizuno, Yasuo Ito, Ryo Tomita, and Yoshio Izuhara

DIFFUSION EXPERIMENT BY THE SF6 TRACER METHOD. *(SF6 tracer ni yoru kakusan jikken). Text in*

Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):275, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 160.)

In order to investigate the dispersion of automotive exhaust gas at short distance ranges, an outdoor dispersion experiment was conducted using sulfur hexafluoride as a tracer. The SF_6 was emitted from a point source of 0 m altitude at the rate of 20 m/min. Air samples were collected at nine points, 10, 0 and 70 m from the point source in a leeward direction and at 22.5 deg angles on both sides for 15 min and analyzed by gas chromatography. The dispersion parameters for SF_6 were obtained and compared with those obtained by the Sutton, Pasquill-Gifford, and Leigton and Dittmer methods. The wind velocity was 2.2 m/s; however, the wind direction was unsteady, and the tracer concentration was not symmetrical on both sides of the main axis. Dispersion from a point source at short distance range is greatly affected by the turbulence and wind direction.

60668 **APTIC NO. 82882**

Fujiya, Yoshiyasu and Yasuo Ito

CALCULATION METHOD FOR NOX CONTRIBUTION RATE. *(NOx kiyoritsu santeiho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):407, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 283.)*

For efficient air pollution control, the contribution rates of stationary and mobile sources have to be clarified. In the case of nitrogen oxides, the estimation of contribution rates is difficult due to complex pollution from both sources. The calculation method for NOx contribution rates based on the concept of the box model was evaluated. Descriptions of the theoretical derivation of calculations of NOx and carbon monoxide concentrations in a given box are given. The ratio (R) of NOx concentration (sum of NOx emitted by i number of cars)/CO concentration (sum of CO emitted by i number of cars) was in the range of 0.061 (PL mode)-0.097 (OP mode). In the period when a certain driving mode is dominant, the R is considered to be constant. Therefore, CNOx equals RCO. Since CNOx equals CNOx (automobiles) + CNOx (stationary source), the contribution rate (T) of automobiles can be given by T equals RCCO/CNOx equals R (CNOx/CCO). The ratio of NOx and CO concentrations measured by the Tokyo Air Pollution Monitoring Center was in the range of 0.02-0.05. In this case, the value of T becomes larger than one. The reasons for such contradiction are being investigated.

60669 **APTIC NO. 76367**

Fukuda, Kazuyoshi and Shizuo Tsunogai

PB-210 IN PRECIPITATION IN JAPAN AND ITS IMPLICATION FOR THE TRANSPORT OF CONTINENTAL AEROSOLS ACROSS THE OCEAN. *Tellus (Uppsala), 27(5):514-521, 1975. 26 refs.*

The budget of lead-210 and water substance in the atmosphere over the sea of Japan and the Japan Islands was investigated. In the troposphere lower than the 500 mb level height where the horizontal divergence of vapor, liquid, and solid water fluxes are negligibly small, 40% of aerosols transported from the continent are collected by the snow over the Sea of Japan and the Japanese Islands in winter. When a dry and cold air mass is transported from the continent across the Sea of Japan, a great deal of moisture is supplied from the relatively warm Sea of Japan and the continental aerosol is effectively removed from the air by the snow over the coastal area of the Sea of Japan.

60670 **APTIC NO. 84636**

Fukuoka, Y.

WEATHER CONDITION AND AIR POLLUTION OF THE CITY IN BASIN REPT 2. *(Bonchi toshi no kiko to taiki osen No. 2). Text in Japanese. Tohoku Chiri (Ann. Tohoku Geogr. Assoc.), 27(3):124-129, July 1975. 15 refs.*

Since Fukushima is a basin city, it could suffer from smog in the future if combustion of fossil fuel increases. Therefore the ozone concentration of the city and the effects on this concentration of climatological factors were investigated. Ozone concentration was estimated by the cracking of rubber. The ozone concentration in the urban area was greater than in the suburbs, while in the foothills of Mt. Shinobu it was intermediate. Climatological factors have a complex influence on the ratio of urban ozone to that of the suburbs, with wind direction one of the most decisive factors.

60671 **APTIC NO. 83512**

Fusamura, Nobuo and Satoru Natsuda

ANALYSIS OF GAS DIFFUSION AROUND AN EMISSION SOURCE AT GROUND LEVEL. *(Chihyo hasseigen kinbo no gasu kakusan kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):279, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, 163.)*

The diffusion of a large amount of gas at ground level was studied, using a diffusion calculation for high concentration regions in the immediate vicinity of an emission source; the Sakagami diffusion equation was used. Descriptions of the diffusion equation and the calculation procedure are given. The results of a diffusion experiment using a liquefied ethylene explosion and fire conducted by the Government Chemical Industrial Research Institute, Tokyo, were compared with calculated values obtained using the Sakagami equation. The C_2H_4 concentration isopleths are given.

60672 **APTIC NO. 76607**

Galindo, Ignacio

PHYSICAL AND MATHEMATICAL STUDIES CONCERNING ATMOSPHERIC TURBIDITY. *(Physikalische und mathematische Untersuchungen zur atmosphaerischen Truebung). Text in German. Arch. Meteorol. Geophys. Bioklimatol., Ser. B, 23(3):225-254, 1975. 28 refs.*

The actinometric integral-equation of extinction is solved by finite iterations with fast convergence. For the analysis of the entire extinction process, 4 cases are considered: the extinction in a clear and dry atmosphere, in a clear and humid one, in a turbid and dry one, and in a turbid and humid one. For each of these cases there is a particular solution of the primitive algorithm. In the clear dry atmosphere (aerosol content beta equals 0) the loss of the incident radiation is due mostly to the scattering by air molecules. In the case of the clear humid atmosphere the values of the water vapor absorption as determined by various authors are compared. The formulas derived by Howard, Burch, and Williams for the determination of the absorption by carbon dioxide and water vapor are applied, and similar, more precise values than given by Fowle are obtained. For the extinction in a turbid dry atmosphere it is shown that for the value alpha equals 1.3 of the wavelength exponent the direct radiation is transformed into sky radiation as a function of the aerosol concentration and of the air masses. If alpha is not a constant one can obtain a family of turbidity values, alpha and beta, from the actinometric measurements. Finally, the extinction in a turbid humid atmosphere is treated. A relation between the total amount of water in the atmosphere and turbidity and vapor extinction is derived. The general water absorption formula is investigated. (Author abstract)

60673 **APTIC NO. 79648**

Gartrell, G., Jr. and S. K. Friedlander

RELATING PARTICULATE POLLUTION TO SOURCES: THE 1972 CALIFORNIA AEROSOL CHARACTERIZATION STUDY. *Atmos. Environ. 9(3):279-299, March. 1975. 21 refs.*

Pollutant aerosol is composed of a mixture of natural background material, solids, and liquids introduced into the atmosphere from man-made sources, and the products of certain gas-to-particle transformation processes. The relative contributions of various types of sources to the primary and secondary aerosol can be estimated from the chemical composition and emission inventories. More detailed information on size and chemical element distributions is obtained by making coagulation and growth calculations. Contributions of different sources to visibility degradation can be estimated from changes in light scattering produced by the various components. The methodology has been applied to chemical and physical data averaged over 2 hr sampling periods in Pasadena and Pomona in the fall of 1972. The mass contributions of various sources to the total particulate pollution in Fresno, San Jose, and Riverside have also been estimated based on chemical element balances and source inventories. Measurements were made during the summer and fall of 1972. Visibility deterioration in Pasadena and Pomona can be largely ascribed to nitrates, sulfates, organics, and ammonia, converted from the gas phase, together with water. (Author abstract)

60674 **APTIC NO. 79618**

Gibson, A. J. and L. Thomas

ULTRAVIOLET LASER SOUNDING OF THE TROPOSPHERE AND LOWER STRATOSPHERE. *Nature (London), 256(5518):561-563, Aug. 14, 1975. 15 refs.*

Measurements were made with a ground based, ultraviolet laser operating in the wavelength range 297 to 308 nm, which relate to atmospheric transmission between ground level and about 20 km, and particularly to the contributions of absorption by minor constituents. The laser radar system used a tuned dye laser. The results indicate either appreciable scattering and absorption by aerosols between 5 and 20 km, or absorption by a minor molecular constituent, probably ozone. The concentrations of sulfur dioxide, hydroxyl, and other absorbing constituents above 5 km are expected to be too low to give detectable attenuation. Wavelengths were also used corresponding to a ratio of 1:1.7 in the ozone absorption spectrum and near minima in the SO2 spectrum. The difference in attenuation would arise from absorption by ozone. The results correspond to ozone concentration of about 4 times 10 to the 17th power per cu m, independent of height. The two-way transmission coefficient below 5 km at 297 nm was lower by a factor of 10 than that at 308 nm. These results can be best interpreted in terms of absorption by water vapor.

60675 **APTIC NO. 84198**

Giebel, Josef

GLOBAL ASPECTS OF AIR POLLUTION. *(Globale Aspekte der Luftverschmutzung). Text in German. Umschau Wiss. Tech., 75(22):685-690, 1975. 19 refs.*

Differences of air pollution and its contributory factors on a global scale were discussed and related to growing urbanization and industrialization. The diluteness capability of the atmosphere was dependent on meteorological conditions occurring temporarily in 1 location and different climatic zones all over the globe. The most important meteorological parameters were wind velocity and direction, atmospheric turbulence, and particularly the thickness of the mixing stratum, which varied proportionately to the intensity of solar radiation rising from morning to afternoon, except in coastal areas, and seasonally from a high in the summer to a low in the winter. The respective values for the Ruhr Region were 1500 m and 400 m. The mixing heights also increased toward the equator. The highest magnitudes and least seasonal variation were found in subtropical Salta/Argentina. In the extremely cold climate of Eastern Siberia, atmospheric absorptive capacity was very low. Increasing solar radiation intensity resulted in the formation of photochemical smog due to orographically unfavorable locations. The dwelling period of sulfur dioxide in the troposphere varied from a few hours to several days and that of sulfates in the stratosphere lasted a few years. The same finding was made for carbon dioxide from fossil fuel and fluorocarbons from injection fuel. Atmospheric decomposition rates of SO2 in industrial regions of moderate latitudes would run to about 10%/hr in the winter. Precipitation was extremely significant for atmospheric self-purification as demonstrated its pollution content. Rain could absorb the more pollutants the finer its droplets were. Sulfur dioxide, the general indicator for air pollution in the cold and moderate zones, was 140 million tons/yr emitted due to human activity and bound to go higher because of increasing consumption of fossil fuels.

60676 **APTIC NO. 81534**

Gifford, F. A.

ATMOSPHERIC DISPERSION MODELS FOR ENVIRONMENTAL POLLUTION APPLICATIONS. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., 25p., June 1975. 105 refs. (Presented at the American Meteorological Society Workshop on Meteorology and Environmental Assessment, Boston, Mass., Oct. 1975.)*

The application of atmospheric dispersion models to environmental pollution applications is discussed. Topics covered include: models based on the statistical theory of turbulence, similarity theory, and gradient transport theory; plume modeling applications to various space and time scales; buoyancy effects; the modification of plume models for adaptation to various environmental problems and exceptional atmospheric flows; and modeling removal, transformation, and resuspension. In general, practical diffusion modeling involves an assortment of exceptional flows and conditions that are not yet fully accessible to theoretical treatment.

60677 **APTIC NO. 82615**

Goodman, Jindra K.

THE MICROSTRUCTURE OF CALIFORNIA COASTAL FOG AND STRATUS (PRELIMINARY REPORT). *San Jose State Univ., San Jose, Calif., Dept. of Meteorology, NSF Grant GA-42464, Rept. 75-02, 61p., Oct. 1975. 19 refs.*

Preliminary results from a study of the microphysical properties of advection fog are summarized. The micrometeorological and microphysical characteristics of advection fog occurring on the San Francisco Peninsula were measured. The microphysical development of the fog in each case was quite similar, despite large differences in the synoptic scale features. Generally, the mean droplet diameter and liquid water content increased with height. The drop size distribution broadened with height and throughout the fog life cycle. All cases formed drizzle drops in the uppermost portions of the marine layer, which precipitated downward with time. The initial drop size distribution in each case showed a close correlation with the air mass parcel history which ultimately determined the available condensation nuclei. The marine air inversion interface played a crucial role in drizzle development by supporting both radiational cooling and mechanical mixing processes. The vertical measurements of sea salt particles showed that even in strong inversions the particles penetrated the stable layer with a 70 to 80% efficiency. (Author abstract modified)

60678 **APTIC NO. 76289**

Grassl, Hartmut

ALBEDO REDUCTIONS AND RADIATIVE HEATING OF CLOUDS BY ABSORBING AEROSOL PARTICLES. *(Verkleinerung der Reflexion und Erwaermung von Wolken durch absorbierende Aerosolteilchen). Betr. Phys. Atmosphaere, 48(3):199-210, 1975. 16 refs.*

Changes in the albedo reduction and radiative heating of clouds by absorbing aerosol particles are established. The comparably strong absorption by aerosol particles is felt inside clouds because of the very slight absorption of liquid water and gaseous constituents of the atmosphere in the 0.35 to 0.80 micrometer wavelength interval. This additional absorption reduces cloud albedo and leads to a heating of the clouds due to the maximum of solar radiation in the abovementioned wavelength interval. The cloud albedo reduction and the radiant flux divergence are given for a realistic estimation of aerosol particles in cloud air and inside cloud droplets. The calculation procedure follows the matrix operator theory for optically thick media. A comparison between cloudless and overcast skies shows an enhanced aerosol influence with overcast skies mainly because of higher order scattering. (Author abstract modified)

60679 **APTIC NO. 84043**

Grassl, Hartmut

ALBEDO REDUCTION AND RADIATIVE HEATING OF CLOUDS BY ABSORBING AEROSOL PARTICLES.

Beitr. Physik Atmosphaere, 48(3):199-210, 1975. 16 refs.

Aerosol particles show strong absorption inside clouds because of the very slight absorption of liquid water and gaseous constituents of the atmosphere in the 0.35-0.80 micron wavelength interval. This additional absorption reduces cloud albedo and leads to a heating of the clouds due to the maximum of solar radiation in the abovementioned wavelength interval. The cloud albedo reduction and the radiant flux divergence are given for a realistic estimation of aerosol particles in cloud air and inside cloud droplets. The calculation procedure follows the matrix operator theory for optically thick media. A comparison between cloudless and overcast skies shows an enhanced aerosol influence with overcast skies mainly because of higher order scattering.

60680 **APTIC NO. 83109**

Gregorczuk, Marek

THERMAL POLLUTION IN THE UPPER SILESIAN INDUSTRIAL AREA AND ITS CLIMATIC REPORT.

(Zanieczyszczenia termiczne w Gornoslaskim Okregu Przemyslowym i ich efekt klimatcyczny). Text in Polish. Ochrona Powietrza (Warsaw), 9(4):120-124, 1975. 16 refs.

On the basis of 3-year mean monthly data on air temperature for January and July obtained from 28 meteorological stations in the Upper Silesian Industrial Area and environs between 1975 and 1959, tests were conducted on the spatial arrangement of air temperatures. All of the stations taken into account were located at distances of more than 1 km from industrial sources of pollution and in the immediate environment of vegetation. Thermal differences between the Upper Silesian Industrial stations and the bordering area were small and were most marked in periods of weak turbulence and wind change (morning and evening), when they did not usually exceed 1.5 C.

60681 **APTIC NO. 82639**

Groves, Robert J.

THE DEVELOPMENT OF A METEOROLOGICAL FORECASTING SYSTEM DESIGNED TO PREDICT SULFUR DIOXIDE CONCENTRATIONS IN AMBIENT AIR.

Preprint, Magma Copper Co., San Manuel, Ariz., 4p., 1975. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)

The development of a meteorological forecasting system designed to predict ground-level sulfur dioxide concentrations in the vicinity of a primary copper smelter is described. Locally prepared meteorological charts were used in conjunction with micro-scale meteorological features indicated by air monitoring stations in the plant s vicinity to produce an SO2 concentration forecast. Application of the forecasting system to the smelter area revealed that selective adjustments to reverberatory furnace operation and the start-up of a newly constructed sulfur acid plant resulted in substantially reduced ground-level SO2 concentrations in the area.

60682 **APTIC NO. 76369**

Guldberg, Peter H.

A COMPARISON STUDY OF PLUME RISE FORMULAS APPLIED TO TALL STACK DATA.

J. Appl. Meteorol., 14(7):1402-1405, Oct. 1975. 7 refs.

Three plume rise formulas are compared in their ability to model the final rise of hot, buoyant plumes from tall stacks. The formulas include the model proposed by Briggs (1969) and two models developed at the Air Quality Branch of the Tennessee Valley Authority (TVA) in 1971 (TVA:1971) and in 1972 (TVA:1972). The Briggs model best predicts the observed final plume rise during periods of low wind speed. This model slightly underpredicts plume rise in these conditions which implied that its use in diffusion model calculations would slightly overestimate maximum ground level pollutant concentrations. At higher wind speeds the TVA;1972 model performs best. Overall these two models perform equally well in making predictions of final plume rise. (Author conclusions modified)

60683 **APTIC NO. 84427**

Haagen-Smit, Arie J.

THEORY AND PRACTICE OF AIR CONSERVATION.

In: Science Scientists and Society. William Beranek, Jr. (ed.), Tarrytown-on-Hudson, N. Y., Bogden and Quigley, 1975 (?), p. 29-54.

Factors contributing to the formation of photochemical smog in Los Angeles are discussed. The peculiar geographic and meteorological conditions in Los Angeles create ventilation in the Los Angeles region which is inadequate to carry away the pollutants. There is an almost daily temperature inversion condition. The temperature at ground level is colder than at higher altitudes, so air does not rise and mix freely with the higher layers of the atmosphere. Oxidants, largely ozone, are an important symptom typical of the Los Angeles smog. They are formed as soon as the sun rises, reach a maximum in Pasadena during the middle of the day, and disappear when the sun goes down. Ozone is formed from the major pollutants, oxides of nitrogen and hydrocarbons. The smog reactions are often accompanied by aerosol formations, explaining part of the haze associated with smog attacks.

60684 **APTIC NO. 76353**

Hage, K. D.

URBAN-RURAL HUMIDITY DIFFERENCES.

J. Appl. Meteorol., 14(7):1277-1283, Oct. 1975. 14 refs.

Urban and rural airport surface weather observations in a 13-year period of rapid city growth were used to document city effects on absolute and relative humidity in a dry climate at fairly high latitudes. On the average in all but winter months the city had lower relative humidities at all hours with mean monthly differences of more than 10% at night in summer. Urban absolute humidities were lower by day but higher at night than those in the country in the warm season. In winter both relative and absolute humidities were higher in the city because of vertical mixing and combustion sources of water vapor. Both processes were important at average winter temperatures, but combustion sources dominated at low temperatures. Annual maxima in absolute humidity differences were found at night in March and August (city, moist) and by day in July (city, dry). The largest mean monthly differences in absolute humidity exceeded 0.005 g/m. (Author summary modified)

60685 **APTIC NO. 80101**

Hage, K. D., J. Gray, and J. C. Linton

ISOTOPES IN PRECIPITATION IN NORTHWESTERN NORTH AMERICA.

Monthly Weather Rev., 103(11):958-966, Nov. 1975. 18 refs.

Regional analyses of oxygen and deuterium isotope concentrations in precipitation from selected stations of the International Atomic Energy Agency-World Meteorological Organization global network were performed. Departures from Dansgaard s regression between oxygen 18 concentrations and surface temperatures in western Canada are attributed mainly to differences in initial water vapor isotope concentration at inland stations. Snow data show little variation in corrleation with height up to 800 mb, and larger unexplained variance than

rain, despite the fact that evaporation and isotope exchange effects are small for snow. Using simultaneous upper air temperature and wind data the 018 variations in snow are attributed both to large condensation temperature variations that can occur in winter storms, and to the condensation of water vapor of different origin and history. Isotope concentrations characteristic of precipitation derived from reevaporated water are associated with strong westerly flow below cloud level. Isotope concentrations characteristic of coastal station precipitation are associated with easterly low level flow or light winds.

60686 APTIC NO. 79242

Hales, J. M. and W. G. N. Slinn

NATURAL RECOVERY PROCESSES IN POLLUTED ATMOSPHERES. *Preprint, American. Inst. of Chemical Engineers, New York, 40p., 1975. 99 refs. (Presented at Complete WateReuse: Water s Interface Energy, Air, Solids, National Conference, 2nd, Chicago, Ill., May 4-8, 1975.)*

Natural recovery processes in polluted atmospheres are reviewed in terms of chemical reactions, precipitation scavenging, and dry deposition. Topics discussed include: time and space scales for atmospheric recovery processes, atmospheric modeling aids for source-receptor analysis, and recent advances in the parameterization of natural recovery processes. A tabulation of precipitation sampling networks in the United States and their purposes is also provided. Natural recovery processes are estimated to result in the removal of 0.04 ppm sulfur compounds/yr.

60687 APTIC NO. 82753

Hameed, S., S. A. Lebedeff, and R. W. Stewart

A MODEL STUDY OF THE IMPACT OF EMISSION CONTROL STRATEGIES ON LOS ANGELES AIR QUALITY. *Preprint, National Aeronautics and Space Administration, New York, Inst. for Space Studies, 6p., 1975. 7 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

A generalized cell model was developed for the calculation of city-wide averages of photochemical smog components in Los Angeles. This model takes into account the effects of variations with time and of the source strengths, the wind field, and the mixing depth. The effect of the influx of background pollution from outside the modeled volume is also included. The results of the validation and sensitivity studies carried out with the generalized cell model are briefly reviewed, and the impacts on Los Angeles air quality of four control strategies are studied. The strategies studied are: 30% reduction in carbon monoxide, reactive hydrocarbon (HC), and nitric oxide emission from mobile sources; reducing vehicle emissions over a 64 sq mi area nearly centered in downtown Los Angeles; the EQL strategy consisting of a 62% reduction in CO emissions together with a 50% cut in initial CO load, 79% reduction in HC emissions from mobile sources with a 63% cut in initial load, and 73% reduction in nitric oxide emissions from mobile sources with a 58% cut in initial nitrogen oxides load; and a zero emissions strategy involving the total elimination of all emissions without changing initial conditions. Results are compared with those of a previous study of the same strategies with a substantially different model. All the strategies result in reductions in mean city-wide ozone concentrations throughout the day according to the generalized cell model. The most effective strategy for reducing peak ozone concentration in the previous model was the zero emissions, while the generalized cell model found the EQL strategy to be far more effective. The greatest difficulty in modeling the impacts of emission control strategies is the sensitivity of the calculated results to boundary and initial concentration values of the model. As a consequence of this sensitivity to prescribed inputs, present models can provide only qualitative guidelines to the relative effectiveness of alternate control strategies. (Author abstract modified)

60688 APTIC NO. 79803

Hampson, Robert F., Jr. and David Garvin (eds.)

CHEMICAL KINETIC AND PHOTOCHEMICAL DATA FOR MODELLING ATMOSPHERIC CHEMISTRY (FINAL REPORT). *Dept. of Commerce, Washington, D. C., National Bureau of Standards, Dept. of Transportation Contract 3165409, Rept. NBS TN-866, 118p., June 1975. 221 refs.*

GPO

A table of data for gas phase chemical reactions and photochemistry of neutral species is presented. Specifically, it gives preferred values for reaction rate constants, photoabsorption cross sections, and quantum yields of primary photochemical processes and also cites recent experimental work. It provides the basic physical chemical data needed as input for calculations modelling atmospheric chemistry. An auxiliary table of thermochemical data for the pertinent chemical species is also included. (Author abstract)

60689 APTIC NO. 81533

Hanna, Steven R.

URBAN DIFFUSION PROBLEMS. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. 75/8, 20p., June 1975. 95 refs. (Presented at the American Meteorological Society Workshop on Meteorology and Environmental Assessment, Boston, Mass., Oct. 1975.)*

Problems peculiar to the successful development of diffusion models for urban areas are discussed. Topics covered include: the estimation of emissions, boundary and initial pollutant concentrations, meteorological conditions, removal mechanisms, rollback models, statistical models, analytical models, models based on K theory, Gaussian models, and model output evaluation. The Regional Air Pollution Study in St. Louis is briefly discussed in connection with the utilization of its data for the further testing and development of urban diffusion models.

60690 APTIC NO. 76474

Harnack, R. P. and H. E. Landsberg

SELECTED GASES OF CONVECTIVE PRECIPITATION CAUSED BY THE METROPOLITAN AREA OF WASHINGTON, D. C. *J. Appl. Meteorol., 14(6):1050-1060, Sept. 1975. 19 refs.*

The release of isolated summer showers in the Washington, D. C. area, as related to the urban heat island, was studied for nine propitious synoptic situations in 1968, 1972, and 1973. Parcel theory, using urban surface temperature and upper air soundings, permits comparison between predicted and observed cloud behavior. In all cases the urban thermal effect is the likely trigger force for shower development. Vertical wind data and cloud energetics permit an estimate of rainfall positioning in the metropolitan area. In eight of the nine cases, this yields the correct placing of the urban induced showers. Three cases are presented. (Author abstract modified)

60691 APTIC NO. 82580

Harrison, Halstead, Timothy V. Larson, and Peter V. Hobbs

OXIDATION OF SULFUR DIOXIDE IN THE ATMOSPHERE: A REVIEW. *Preprint, Washington Univ., Seattle, Atmospheric Sciences Dept., 7p., 1975. 45 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

The oxidation of atmospheric sulfur dioxide is reviewed. Oxidation rates of atmospheric SO2 to sulfate aerosols vary between characteristic times as short as a few minutes to as long as a few days. Both homogeneous processes between gaseous SO2 and reactive free radicals and heterogeneous processes between dissolved sulfites and oxygen or ozone are likely to be rate controlling at different times. Catalysis by metal ions and inhibition by organic molecules occur at con-

centrations as low as 10 to the -7 molar. Ambient ammonia strongly influences hydrometeor pH and oxidation rates. The temperature dependence of heterogeneous rates as well as the dependences on the partial pressures of oxygen, ozone, and nitric oxide/nitrogen dioxide are poorly known, especially in the presence of metal catalysts. (Author abstract modified)

60692 **APTIC NO. 80236**

Harrison, Paul R.

PARTICLE RESUSPENSION IN URBAN ATMOSPHERES. *Preprint, Meteorology Research, Inc., Boulder, Colo., 17p., 1975. 10 refs. (Presented at the National Conference on Energy and the Environment, 3rd, Sept. 29-Oct. 1, 1975.)*

While formulating a control strategy for achieving the 1975 Total Suspended Particulate Ambient Air Quality Standards, it became evident that other emission mechanisms were in play than those used for the control of gaseous pollutants. Monthly particulate levels at 20 stations in Chicago were studied. The highest and lowest stations differed by about a factor of two. Siting a sampler over a large area of grass can halve the particulate loading as compared to adjacent high activity areas. Wind speeds in excess of 12 mi/hr are efficient reflotation velocities. Much of the material in urban areas is related to automobile activities, both direct emissions from tire dust and exhausts and the creation of wind fields that cause resuspension. The general trend follows rainfall patterns and agricultural activities. Street washing and foliation of vacant land are desirable and effective control strategies. (Author abstract modified)

60693 **APTIC NO. 76359**

Harwood, R. S. and J. A. Pyle

A TWO-DIMENSIONAL MEAN CIRCULATION MODEL FOR THE ATMOSPHERE BELOW 80 KM. *Quart. J. Roy. Meteorol. Soc. (London), 101(430):723-747, Oct. 1975. 42 refs.*

A two-dimensional numerical model for the interactions of dynamics, photochemistry, and radiation in the atmosphere below 80 km was developed. The dependent variables are zonal means of the relevant meteorological quantities, held as functions of time, latitude, and height (log pressure) with a resolution of pi/19 in latitude and 0.5 in pressure scale height. Eddy fluxes of heat and matter are treated by large scale diffusion coefficients. Radiative coolings due to carbon dioxide and ozone emission are computed from simplified expressions which are essentially cooling-to-space approximations with emissivities obtained by curve fitting against the results of more elaborate treatments. Absorption of solar radiation by O3 is obtained from tabulations of absorption against O3 amount traversed. Radiation and latent heat release in the troposphere are specified climatologically. (Author summary modified)

60694 **APTIC NO. 76500**

Hashimoto, Y.

STUDIES ON THE POLLUTION MECHANISM AND METAL CONCENTRATION IN THE ATMOSPHERE OF LOCAL DUST PARTICLES. DUST PARTICLES DIFFUSION FROM STACK AND EXPERIMENT FORMULA. *(Kyokusho-gata jinkai bushitsu ni yoru taiki osen). Text in Japanese. Kuki seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 12(5):27-42, Jan. 1975.*

A theoretical formula for the calculation of scattering distance of dust particles from a source was obtained by developing Navier Stoke s theory. It was confirmed by field experiment. The equation for effective plume height is also given. The quantity of precipitated dust calculated with a third formula was approximately that obtained by measurement. Specially marked dust particles were used in a field experiment, and the results statistically analyzed. The horizontal diffusion width of the dust particles was very narrow, and their behavior depended on their weight and weather conditions. Dust deposition was most pronounced at a distance of 700 to 1000 m, while the quantity of precipitating dust decreased at distances over 2000 m, because it became suspended. Environmental discharge of labeled dust particles and the use of experimental formulae made it possible to determine the contamination pattern of an area due to precipitating dust particles. Coefficients were determined for these formulae. (Author abstract modified)

60695 **APTIC NO. 84633**

Hayashi, M. and O. Yokoyama

AN APPLICATION OF METEOROLOGICAL DATA FOR AN AIR POLLUTION ESTIMATE. *(Taiki osen hyoka eno kisho shiryo no oyo no kokoromi). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(5):9-22, Sept. 1975. 17 refs.*

A simulation model for air pollution from multiple sources was developed by combining plume and puff models with other meteorological parameters and their interaction with the environment which were measured in the Kashima industrial area. The diffusion parameters were chosen by comparing environmental observations with the relevant theoretical simulation. The model produced can be used for a simulated assessment of the effect of the appearance of new industries. The estimation consists of 1-hour averaged isopleths of pollutant speed and direction, 1-year averaged isopleths for a typical year of meteorological statistics in the area, and the cumulative frequency and concentration relationships for representative points.

60696 **APTIC NO. 82769**

Heffter, Jerome L., Albion D. Taylor, and Gilbert J. Ferber

A REGIONAL-CONTINENTAL SCALE TRANSPORT, DIFFUSION, AND DEPOSITION MODEL. PART I: TRAJECTORY MODEL. PART II: DIFFUSION-DEPOSITION MODELS. *National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Labs., Rept. ERL ARL-50, 31p., June 1975. 10 refs.*

A computerized post-facto trajectory model for calculating the transport, diffusion, and deposition of air pollutants on regional and continental scales is described. A month, season, or year of trajectories at 6-hour time intervals may be calculated forward or backward in time from any origin in the Northern Hemisphere for durations up to 10 days. Trajectory computations use winds at any altitude above sea level or winds averaged through any desired layer above average terrain. The computer output includes a listing of individual trajectory end points after selected durations, plotted trajectories for any desired map scale on either Mercator or Polar Stereographic projections, and plotted maps showing the percent frequency of trajectory traverses over grid squares. A gaussian plume model is combined with the trajectory model to calculate long-term (monthly, seasonal, annual) mean ground level air concentrations and deposition amounts. Both wet and dry deposition are incorporated in the model. Another model calculates short-term (once or twice a day) mean ground level air concentrations for selected sampling stations. The computer output includes plotted maps showing long-term concentrations and deposition amounts as well as tables of short-term concentrations where the contributions from individual plumes are identified. (Author abstract modified)

60697 **APTIC NO. 80280**

Herman, Mark N.

PREDICTING THE HIGHEST GROUND LEVEL CONCENTRATIONS WITH SIMPLE DISPERSION EQUATIONS. *Preprint, Exxon Research and Engineering Co., Florham Park, N. J., 20p., 1975. 17 refs. (Presented at the Energy and the Environment National Conference, 3rd, Sept. 29-Oct. 1, 1975.)*

A critical concentration formula which included a dependency of plume rise on downwind distance was used to predict maximum ground level concentrations resulting from air pollution sources. Critical concentrations were obtained for three simple dispersion calculation methods. The critical concentration predicted by a method consisting of the Briggs plume rise equation and Pasquill-Gifford dispersion coefficients (Environmental Protection Agency-Briggs) was generally the lowest. That predicted by a method consisting of the Holland plume rise equation and Pasquill-Gifford dispersion coefficients (EPA) was generally the highest for smaller processing stacks but was exceeded by that predicted by a method of the American Society of Mechanical Engineers for large power plant stacks. With the EPA and EPA-Briggs methods, critical concentrations at category C stability (slightly unstable) were higher than those at D stability (neutral). The different predicted critical concentrations indicate that, while the various methods may currently give useful estimates of critical concentrations, more data are needed to validate a particular method for a particular emission source before the predicted critical concentrations can be considered accurate enough to determine compliance with ambient air quality standards.

60698 **APTIC NO. 83507**

Hikichi, Takeichi, Shiro Ohnishi, Junichi Ueda, Katsuharau Okazaki, Sumio Tokuda, Hiroshi Nakamura, and Masakazu Takahashi

METEOROLOGICAL FEATURES AND DIFFUSION MODEL OF KYOTO CITY. *(Kyoto-shi ni okeru kisho tokusei to kakusan modrtu no kangaekata). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):267, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 153.)*

Kyoto is a basin surrounded by mountains on three sides, and its meteorological characteristics are quite different from those in a littoral area; this should be taken into consideration in any diffusion model for sulfur dioxide pollution. Analytical results for time-zone classification, wind velocity classification, and meteorological factors for diffusion parameters are given. The time-zone was classified into three zones, 8:00-12:00, 13:00-18:00 and 19:00-7:00, based on the wind velocity, diurnal variation of SO2 concentration, and variation in emission quantity of SO2. The wind velocity frequency distribution was estimated. The occurrence of a wind velocity of less than 1.0 m/s was most frequent and (about 20-30% throughout the year), and the use of the puff model is suitable. The most frequent wind velocity was 1.0-1.9 m/s in early morning and during the night, 3.0-4.9 m/s in the afternoon; that in the morning was between these two. The cloud amount and insolation intensity used in Pasquill s stability classification had little effect on SO2 concentration. The temperature difference between ground level and the top of Hiei mountain was used as a stability index.

60699 **APTIC NO. 82634**

Hindman, Edward E., II.

CLOUD CONDENSATION NUCLEI FROM A PAPER MILL - THEIR EFFECTS ON CLOUDS AND PRECIPITATION. *Preprint, Inst. of Electrical and Electronics Engineers, New York, 4p., 1975. 7 refs. (Presented at Environmental Sensing and Assessment, Las Vegas, Nev., Sept. 14-19, 1975.)*

The effects of cloud condensation nuclei emissions from paper mills on clouds and precipitation were investigated. Airborne measurements of aerosol particle size distributions and cloud condensation nuclei supersaturation spectra in the plume of a paper mill and within 12 km of the mill which was located in Washington State revealed that the cloud condensation nuclei broaden the droplet size distributions of small, non-raining, warm clouds located downwind of such mills in the Pacific Northwest. However, calculations based on a cumulus model indicate that the broader drop size distributions should have no significant effect on the total rainfall from warm cumulus clouds in a Florida-type environment. (Author abstract modified)

60700 **APTIC NO. 80188**

Hogstrom, Ulf

CONFIRMING THE LOCAL SOURCES OF OBSERVED AIR POLLUTION IN COMMUNITIES. *Atmos. Environ., 9(10):923-929, Oct. 1975. 7 refs.*

A method is described for assessing the relative contribution of local point sources to the air pollution observed in a community. It is based on a limited number of stations (3-12 stations 0.01 km) measuring sulfur dioxide and smoke as daily means and dust fall as monthly means over a period of 1 to 1-1/2 years. Maps are derived which give qualitative estimates of the relative importance of the various sources to the observed pollution. The effect of distance between source and receptor, of chimney height, stability, and elimination through sedimentation, are implicitly included in the analysis. Much of the success with the method depends on careful siting of the stations. The desirability of at least a rough point source emission survey prior to the actual measurement phase is strongly urged. The method was successfully tested in nine Swedish communities of varying size and type. (Author abstract modified)

60701 **APTIC NO. 80454**

Huertas, M. L. and J. Fontan

EVOLUTION TIMES OF TROPOSPHERIC POSITIVE IONS. *Atmos. Environ., 9(11):1018-1026, 1975. 56 refs.*

A computer program was developed to study the evolution times of tropospheric positive ions. Twenty eight ions were considered; their evolution times are a function of 79 ion molecule rate constants. These calculations show that positive nitric oxide ions are created mainly from positive nitrogen and oxygen ions. Complexes of hydronium ion and water (H30+.(H2O)n, n equal to 1, 2, 3, ..., 7) are formed in less than .001 sec at 760 torr and water concentration of 10% by volume (or 49% relative humidity at 18 C). (Author abstract)

60702 **APTIC NO. 81280**

Hunten, Donald M.

ESTIMATES OF STRATOSPHERIC POLLUTION BY AN ANALYTICAL MODEL. (EDDY DIFFUSION/NOX/SUPERSONIC TRANSPORT). *Proc. Natl. Acad. Sci., U. S., 72(12):4711-4715, Dec. 1975. 24 refs.*

A method for the determination of the vertical flow of an inert tracer by an analytic solution is described. With suitable choices of the height profile of the eddy diffusion coefficient, the vertical flow of an inert tracer can be given by an analytic solution. Odd nitrogen, or NOx, from aircraft exhausts can be regarded as such a tracer, and the amount in the stratosphere resulting from a source of a given strength can be immediately calculated. The resulting destruction of ozone can then be estimated. The principal atmospheric constituents are nitric oxide, nitrogen dioxide, and nitric acid. The end product of the method is a mixing ratio (molecules of odd nitrogen/molecule of air) as a function of height. This quantity is the basic input to chemical models of ozone destruction.

60703 **APTIC NO. 81529**

Ingram, Gregory K.

SIMULATING THE URBAN AIR POLLUTION ENVIRONMENT. *In: The Automobile and the Regulation of Its Impact on the Environment. Norman, Okla., Oklahoma Univ. Press, 1975, Chapt. 5, p. 151-229. 48 refs.*

Variations in air quality within a metropolitan area are investigated by dividing the metropolitan area into a large number of zones and then developing a simulation model to forecast the air quality in each zone as a function of transportation, land use, and meteorological variables. This Transportation and Airshed Simulation Model is subsequently used to analyze several policies that are often proposed to improve air quality levels in metropolitan areas. The results of the policy analysis are then analyzed in terms of cost-effectiveness. A detailed description of the simulation model is provided in an appendix.

60704 **APTIC NO. 82827**

Inoue, Kentaro, Tadashi Higuchi, Minoru Kadota, and Waichiro Kawai

NOX SIMULATION IN MIZUSHIMA INDUSTRIAL AREA. *(Mizushima kogyo chiiki ni okeru chisso sankabutsu osen shumireishon ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):258, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 144.)*

Relationships between nitrogen oxides pollution around the Mizushima industrial area and pollutant sources and meteorological conditions were investigated using a diffusion simulation model. The yearly average NOx and sulfur oxides concentrations measured in 1972 and 1973, and data on flue gas emission sources in Kurashiki, traffic on major highways, and ships in Mizushima harbor were used for simulation calculations. Descriptions of simulation calculation procedures, including the analysis of pollutant source data, the calculation of effective stack height (CONCAWE equation for windy conditions and Briggs equations for calm conditions), the diffusion calculation methods using plume models (Pasquill-Gifford for stability) in windy conditions and puff models (Turner for stability) in calm conditions are given. The regression line obtained showed fairly linear relationships between observed and calculated values, and correlation coefficients were 0.79 for NOx and 0.76 for SOx.

60705 **APTIC NO. 84171**

Irie, Tatehisa, Susumu Yoshizawa, and Shinichiro Kobue

CHARACTERISTICS OF POLLUTANTS DISPERSION IN CHANNEL SPACES. IV. *(Mizojyo kukannai no osen kakusan no seijoni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):274, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 159.)*

Pollutant dispersion in channel space tested was in a wind tunnel with a width (l) of 100 m and a depth (d) of 50, 100, 150 and 200 mm and reported previously. The analytical result concerning a 4-section circulation model is given. The ventilation frequency (n) based on the instantaneous uniform diffusion assumption, and ventilation frequency (N) based on the 4-section circulation model were compared. The ratio of N/n was about 0.9 (d/l less than or equal to 1.0) and 0.85 (d/l greater than or equal to 1.5). Data on the variation in mean concentration at 25 mm lattice points on a vertical plane with wind velocity and recirculation rate are also given with analytical results.

60706 **APTIC NO. 82820**

Ishikawa, Muneo

VARIATIONS OF NUMBER CONCENTRATION AND PARTICLE SIZE DISTRIBUTIONS OF ATMOSPHERIC AEROSOLS. *(Taikichu no earozoru no ryushisu nodo ryudo bunpu no hendo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):212, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 100.)*

Atmospheric aerosols are extremely unstable, and the concentration, particle size, and particle size distribution vary with various factors in a complex manner. In order to investigate the relationship with meteorological factors, the particle number concentration and particle size distribution were measured in Aichi using the particle analyzer Model CI 208A manufactured by Climet Co. Meteorological factors were measured simultaneously. The diurnal variation of particle number concentration (0.5, 1, 3, 5 and 10 micron) measured on Dec. 25-26, 1974 showed marked increases after sunrise and sunset, but very little variation during daytime, and decreased due to sedimentation during the night. The daily variation (measured at noon during the period of Jan. 7-17, 1975) of particle number concentration indicated that on the day after rain the concentration of smaller particles increased, while that of larger particles (above 3 micron) decreased. The former was considered to be attributable to the formation of small particles due to high humidity, and the latter to the wash-out effect of suspended particulates by rain. An empirical equation showing the relationship between particle number concentration and particle size was obtained.

60707 **APTIC NO. 84614**

Ishizuka, Kenichi

DIFFUSION OF NOX FROM VEHICLES UPON THE HIGHWAY. *(Kosokudoro kara no chissosankabutsu no kakusan ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):587, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 318.)*

The diffusion of nitrogen oxides emitted from automobile exhaust gas was studied in a residential area in Yokohama City through which a major highway passed. The air samples were collected from 23 locations, both in summer and in winter. Both an autoanalyzer and the triethanol amine filter method were employed for NOx analysis. The highest level found during summer analysis was 65 micrograms as NO2/100 sq cm/day and the lowest was 8 micrograms as NO3/100 sq cm/day. The winter analysis showed similar NOx levels. The highest NOx levels were observed at the sampling locations closer to the highway. The effects of wind direction and velocity were also noted on the measured NOx levels.

60708 **APTIC NO. 84369**

Johnson, Francis S.

THE OXYGEN AND CARBON DIOXIDE BALANCE IN THE EARTH S ATMOSPHERE. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 49-56. 21 refs.*

The effect of manmade pollution on the oxygen and carbon dioxide balance in the earth s atmosphere is considered. Insecticide and herbicide pollution may be exerting widespread and unforeseen effects on oceanic plankton which convert a large proportion of the earth s carbon dioxide to oyxgen. Increases in carbon dioxide as a result of the burning of fossil fuels are capable of increasing the hothouse effect on the earth and thus driving carbon dioxide out of the ocean into the atmosphere which in turn further increases the hothouse effect. Alternatively, stimulating the growth of phytoplankton by increasing the flow of nutrients to the oceans may result in increased carbon dioxide removal from the atmosphere and a reduction in the hothouse effect and atmospheric temperature.

60709 **APTIC NO. 76354**

Joseph, Joachim H. and Noah Wolfson

THE RATIO OF ABSORPTION OF BACKSCATTER OF SOLAR RADIATION BY AEROSOLS DURING KHAMSIN CONDITIONS AND EFFECTS ON THE RADIATION BALANCE. *J. Appl. Meteorol., 14(7):1389-1396, Oct. 1975. 37 refs.*

The ratio of absorption to backscatter of solar radiation by aerosols during Khamsin conditions was deduced from 4 years of data at two sites in Israel, one in the coastal plain and one in the Judean hills. These values (15 for cloudless days and 11 for khamsinic days) are compared to those available in, or deducible from, published studies of the aerosol effects in various parts of the world. The presence in the atmosphere of most of the aerosols induces a net heating effect, as far as the solar radiation balance is affected, over the regions in which they were measured. The complex part of the refractive index, averaged over the solar spectrum between 0.3 and 2.5 micron (0.03 + or - 0.02 for khamsinic days and 0.08 [illegible] or - 0.02 for normal days) was evaluated. (Author abstract modified)

60710 **APTIC NO. 79650**

Juda, Jan and Stanislaw Crosciel

HYPOTHESIS CONCERNING DISPERSION OF SULPHUR DIOXIDE AND SULPHURIC ACID IN THE ATMOSPHERE. *(Hypothese zur Ausbreitung von Schwefeldioxid und Schwefelsaeure in der Atmosphaere). Text in German. Staub, Reinhaltung Luft, 35(7):281-285, 1975. 7 refs.*

Mathematical models of the propagation (diffusion) of sulfur dioxide emitted from punctiform sources are presented in consideration of different modes of SO2 transformation into sulfuric acid. Calculations of the SO2 concentration at different distances from the emission source under the assumption of constant conversion rate did not give acceptable results. These findings indicated very high sulfuric acid concentrations at great distances from the emission source at low wind velocity. This model could be improved by taking the absorption of sulfuric acid by the Earth s surface into account. Calculations based upon the hypothesis of variable conversion rates as a function of the SO2 concentration showed that the ratio of sulfuric acid sulfur to total sulfur is independent of the distance, but that it is strongly dependent on the wind velocity, which may be true for areas with a single punctiform source. The ratio was found to be in a range of 13-18%, which is in good agreement with measurement data.

60711 **APTIC NO. 83780**

Junge, Christian

CHLOROFLUOROMETHANES AND THE ATMOSPHERIC OZONE LAYER. *(Chlorfluormethane und die atmosphaerische Ozonschicht). Text in German. Umwelt (Duesseldorf), 5(6):48-49, 1975. 4 refs.*

The possible effect of chlorine breakdown from chlorofluoromethanes (CFM) on the atmospheric ozone layer and the resulting implications are discussed. Chlorofluoromethanes 11 and 12 have been increasingly produced for the last twenty years for use as propellant in spray cans, in coolants, and for commercial purposes. Most of the CFM ends up in the atmosphere and perhaps a small portion in the ocean. The CFM reaches the stratosphere where sunlight breaks it down to chlorine and fluorine atoms. The chlorine acts as a catalyst in breaking down the ozone to oxygen. This process continues until the Cl is eliminated from the stratosphere, which can take decades. Since the ozone layer diminishes ultraviolet radiation, a reduction in ozone could lead to increased skin cancer, an expected 2% cancer rise for a 1% ozone reduction. The above conclusions on the effects of CFM are not definite because data on Cl in the atmosphere are inconclusive due to the difficulty in measurement and in determining its origin, whether natural or from man. Also the exact amount of manufactured CFM is unknown. Furthermore, the ozone itself varies with amplitudes of up to 5%, so determining the effect of a 1% decrease will take many years. However, it is expected that the effects of CFM will sharply increase in the near future, and a decision must be made before the feared effects are discernable. The effect of fluorine on ozone is discounted and is not discussed in any detail.

60712 **APTIC NO. 79751**

Kalpazanov, Y. and G. Kurchatova

METEOROLOGICAL FACTORS AND AIR POLLUTION OF SOFIA. *(Meteorologicheskie faktory i zagryaznenie atmosfericheskogo vozdukha v Sofii). Text in Russian. Gigiena i Sanit., no. 5:83-84, 1975. 7 refs.*

The concentrations of nitric oxide, nitrogen dioxide, oxidants, formaldehyde, and hydrogen sulfide were measured in Sofia, Bulgaria, during the June 1971 through June 1973 period along with the barometric pressure, cloudiness, visibility, temperature, relative humidity, and wind velocity to establish correlations between the air pollution levels and certain meteorological factors. The results of the multiple regression analysis indicate certain correlations between meteorological factors and the nitric oxide, nitrogen dioxide, oxidant, formaldehyde, and hydrogen sulfide concentrations. However, these correlations should not be overestimated. There was no correlation between the wind velocity and the nitric oxide concentration, nor between the nitrogen dioxide or hydrogen sulfide concentration and relative humidity and cloudiness, nor between the oxidants and air temperature. Rather close correlation was established between the nitrogen oxides and aldehydes concentrations and temperature, between thee oxidant concentrations and low-level cloudiness and relative humidity, and between the hydrogen sulfide concentration and visibility, temperature, and wind velocity.

60713 **APTIC NO. 82800**

Kawamura, Takeshi

DISTRIBUTION OF WIND SYSTEM IN BROAD AREA. *(Koiki no fukei bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):420, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 162.)*

Characteristics of wide range wind system distribution were investigated by dividing the Japanese islands into five regions. Wind data of about 140 days obtained at about 1300 locations were used and 700 sheets of streamline diagrams were prepared and analyzed. Streamline diagrams were classified by the distribution pattern, and air current patterns were defined. At each air current pattern, the streamline diagram of the surface wind was prepared. Analyses of streamline diagrams of surface wind showed definite and characteristic local patterns, which changed regularly corresponding to the changes in pressure pattern. For surface wind velocities above 10 m/s, the air current pattern can be classified by the gradient wind direction; however, at surface wind velocities below 7 m/s, wind systems with diurnal changes such as sea-land breezes and mountain-valley breezes were dominant.

60714 **APTIC NO. 82811**

Kawase, Yoshiharu and Michiko Miyano

A FINITE-LINE SOURCE DISPERSION MODEL IN AN OBLIQUE OR PARALLEL WIND. *(Shakofu oyobi heikofu no tokino yugensengen moderu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):253, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 139.)*

The surface concentration of air pollutants on highways due to automotive exhaust emission can be calculated by a plume model that considers the emission source as an infinite line source. For diffusion due to oblique winds, K. L. Calder has recently proposed a simple approximation method treating the emission source as an infinite line source. Based on the Calder s theory, an approximation method for all wind directions (oblique winds and parallel winds) was developed in which the source is treated as a finite line. For oblique winds, the contribution rates of the leewind line source and the windward line source are calculated separately. The adequacy of the equation was tested and verified by comparison with calculation results by other methods.

60715 **APTIC NO. 84383**

Kellogg, William W.

CLIMATE CHANGE AND THE INFLUENCE OF MAN S ACTIVITIES ON THE GLOBAL ENVIRONMENT. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 13-23. 10 refs.*

The history of changes in the earth s climate are traced back, and man s potential impact on the climate is discussed in terms of carbon dioxide and particulate pollution, albedo changes, water evaporation from irrigation, and the direct release of heat from energy producing activities. Computer calculations indicate that potential anthropogenic weather modification is likely to take the form of a warming trend, especially in the Northern Hemisphere. This warming trend may result in a major transition in the Arctic Ocean pack ice which represents an unstable part of the ocean-atmosphere system.

60716 **APTIC NO. 79598**

Khandekar, M. L. and T. S. Murty

A NOTE ON BIFURCATION OF BUOYANT BENT-OVER CHIMNEY PLUMES. *Atmos. Environ., 9(8):759-762, Aug. 1975. 9 refs.*

A mechanism is proposed by which bifurcation of a chimney plume could be realized under certain environmental conditions. The bifurcation angle resulting from image effect may critically depend upon the value of the entrainment coefficient. This entrainment coefficient in turn may depend upon the internal circulation of the plume. An optimum value of the entrainment coefficient as determined by the stack exit geometry and the mode of effluent discharge could initiate plume bifurcation under appropriate environmental conditions. (Author conclusions modified)

60717 **APTIC NO. 76421**

Kitabayashi, K. and N. Yokoyama

CALCULATION METHOD FOR LOCAL ENVIRONMENTAL ASSIMILATING CAPACITY. *(Chiiki kankyo yoryo no santeiho). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(5):1-8, Sept. 1975. 6 refs.*

For the efficient and fair enforcement of total emission quantity control regulations, the accurate contribution rate of each emission source has to be known and the emission source control has to be enforced individually. Calculation methods for local assimilating capacity and total emission quantity based on the average ground level concentration, stack height and number of stacks are described, and the importance of emission source composition is discussed. Problem points involved in diffusion simulation models used for the calculation of total emission quantity are discussed with a description of simulation models. The importance of meteorological data, classification of atmospheric stability, and classification of wind velocity are discussed. The background concentration and importance of P-C curve simulation are also discussed.

60718 **APTIC NO. 80480**

Kitabayashi, Koji, Kiyoshi Sugawara, and Shigeo Shimogata

WIND TUNNEL TESTS ON NON-NEUTRAL ATMOSPHERE AND DIFFUSION. *(Hichuritsu taiki to kakusan no fudo jikkenho). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(5):45-54, Sept. 1975. 4 refs.*

Wind tunnel experiments on neutral and stable stratified atmospheres and diffusion are discussed. For the vertical distribution of wind velocities with respect to the strength of turbulence, atmospheric data were reproduced in wind tunnel tests. In another study, predicted values of energy spectrum distribution of turbulence in the vertical direction agreed with values obtained in the wind tunnel. It is difficult in the wind tunnel to reproduce thermally unstable stratified air flow, where the upper layer is stable, and the lower, unstable. Vertical concentration distributions of ethylene were studied in the wind tunnel for neutral and stably stratified flow. The spread of smoke for a stable layer situation is far smaller than that for the neutral situation. Results of studies conducted by Kitabayashi, Orgill, and Cermak, with wind tunnels and fieldwork, on air flow and diffusion around a mountain (Elk Mountain, Colorado), are reported. By discharging titanium tetrachloride from three linear locations, and photographing the smoke, the development of currents skirting the mountain model were easily discerned in wind tunnel experiments.

60719 **APTIC NO. 82826**

Kitabayashi, Koji and Osayuki Yokoyama

A SIMULATION MODEL OF AIR POLLUTION FOR THE INDUSTRIAL AREA. *(Kogyo toshiiki ni okeru taiki osen simureishion moderu Dai-2-ho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):257, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 143.)*

Sulfur oxides concentrations in the Mizushima area were calculated with plume and puff models using meteorological data including insolation intensity, wind direction, wind velocity, and wind direction variation obtained in 1972 and 1973. The yearly average and seasonal average SOx concentrations and P-C curve were obtained and evaluated against observed values. Using plume and puff diffusion equations, concentrations were calculated at 32 wind directions and four atmospheric stabilities in windy conditions and three atmospheric stabilities in clam conditions. The plume rise in calm conditions was calculated using Briggs equation for an inversion layer; the actual pollution was well simulated when the altitude of the inversion layer and the temperature difference were 400 m and 1.3 C at unstable, 300 and 1.5 C at neutral, and 200 m and 2.0 C at stable conditions, respectively. The observed values and calculated values showed a fairly good correlation; however, the P-C relationship was improved only at higher concentration areas.

60720 **APTIC NO. 84637**

Kiyoura, R.

OBSERVATION OF NOX POLLUTION AND ENVIRONMENTAL STANDARDS IN THE WORLD. *(Sekai no NOx osen to kankyo kijunchi no kosatsu). Text in Japanese. PPM (Japan), 6(8):99-104, Aug. 1975.*

Although nitrogen dioxide triggers the generation of photochemical smog, oxidant does not necessarily increase even though nitrogen ozides concentrations in the atmosphere becomes high. When NO2 concentrations exceed a certain level, irrespective of hydrocarbon concentrations, oxidant becomes low, while it becomes high, irrespective of NO2 concentrations, when hydrocarbon concentration increases, suggesting that it is hydrocarbon which influences the level of photochemical smog and not NO2. The effect of low NO2 concentrations on human health has not been clarified. That is why the American standard for NO2 is 7 times more lenient than that of Japan. More stress is laid on control of hydrocarbons and carbon monoxide. Japanese standards have been determined too hurriedly, without waiting for results of long-range studies. The effect of NO2 is cumulative, requiring long-term study before its effect on human health can be clarified, and number of samples in Japan was too low to yield convincing correlations. Of 228 places monitored, only 2% were within the standard range, according to a national survey by the Environmental Agency, but in accordance with American or West Germany standards, more than 98% of such monitoring places would have passed the test. That the Japanese standard of NO2 is based upon scientific error has been pointed out by an American authority, Dr. Shy. His report is translated in the article.

60721 **APTIC NO. 76431**

Knutson, Earl O. and Donald L. Fenton

ATMOSPHERIC SCAVENGING OF HYDROCHLORIC ACID. *IIT Research Inst., Chicago, Ill., National Aeronautics and Space Administration Contract NAS8-30807, Rept. NASA CR-2598, M147, 80p., Aug. 1975. 33 refs.*

The scavenging of hydrogen chloride from a solid rocket exhaust cloud was investigated in a spherical aerosol chamber. Water drops were caused to fall a terminal velocity through a confined solid rocket exhaust cloud and were then collected and analyzed to determine the amount of HCl captured during the fall. The measured chamber HCl concentration, together with the measured HCl deposition on the chamber walls, accounted for 81-94% of the theoretical HCl. The HCl captured by water drops during fall was approximately one-half that predicted by the classifcal Froessling correlation which applies to water drop falling through a clean HCl cloud. No effect of humidity on the scavenging efficiency was detected over a relative humidity range of 69-98%. The experimental scavenging results for 0.9 mm drops were extended mathematically to cover natural rains. An example calculation for scavenging HCl from a solid rocket exhaust cloud was performed using an idealized Kennedy Space Center rain cycle. This rain cycle was calculated to reduce the cloud HCl concentration to 20.6% of its value in the absence of rain. (Author abstract modified)

60722 APTIC NO. 76427

Koenig, L. Randall

A NUMERICAL EXPERIMENT ON THE EFFECTS OF REGIONAL ATMOSPHERIC POLLUTION ON GLOBAL CLIMATE. *J. Appl. Meteorol., 14(6): 1023-1036, Sept. 1975. 17 refs.*

A model of the general circulation of the atmosphere was used to study the consequences of high concentrations of hygroscopic aerosols in a limited geographic region. The experiment was designed to investigate effects of the activity of the aerosol as condensation nuclei; the consequent abnormal production of cloudiness and alteration of precipitation were of primary concern. Values of meteorological parameters generated by the experiment were compared with a control area. Statistical significance was analyzed in order to judge the certainty that experimental variables actually caused changes in certain meteorological variables. Cloudiness increased over the polluted area, and temperature at the surface and in the lower atmosphere became warmer. Rainfall was not significantly altered in the polluted region. The data suggest a possible connection between North American pollution and South American rainfall. Comparison of data from the experiment and the control indicate that in the experiment, rainfall decreased gradually and steadily within a large area of South America centered on the equator. The immediate cause is the movement of the region of maximum moisture convergence northward, toward the polluted area. (Author abstract modified)

60723 APTIC NO. 82828

Koh, Shakunan, Kazuya Hayakawa, and Takeshi Kubo

ANALYSIS AND PREDICTION OF URBAN AIR POLLUTION. *(Toshigata taiki osen kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):256, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 142.)*

Urban air pollution was analyzed based on the concept of total emission quantity control. The sulfur oxides concentration in 23 wards in Tokyo was calculated separately for stationary emission source and mobile source using data of Dec. 6, 1972 for the simulation and box model. Calculated results were in good agreement with measured values. The total allowable emission quantity of SOx calculated using the contribution rate of daily average concentration matrix, allowable daily emission quantity matrix, and allowable environmental concentration matrix was 169,769 t/day. The estimated SOx emission quantity calculated by the multiple regression analysis method was 173,266 t/day for 1977 and 193,435 t/day for 1980, and in about one-third of the wards the emission quantity was below the control level. The industrial gross production, area of industrial sites, and daytime population and fuel consumption quantity were taken into account for the estimation calculation.

60724 APTIC NO. 83953

Komeiji, Tetsuto, Saburo Fukuoka, and Toshio Ohira

RAIN WATER WASHOUT EFFECT. *(Usui no uoshuauto ni kansuru kento). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):377, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 124.)*

Rainfall was collected in Tokyo at two different altitudes: ground level, and 250 m above ground. Analysis of each sample was performed for pH, electrical conductivity, nitrate ion, sulfate ion, nitrite ion, and chloride ion concentrations in order to study the effect of rainfall washout. The nitrite ion concentration in the rainfall collected at ground level was always higher than that at 250 m; the ratio of concentrations was between 2.5 and 6. The difference in the sulfate ion concentrations in the rainfall by altitude was not so great as that of the nitrite ion concentrations. Higher sulfate ion concentrations in the rainfall at 250 m than at ground level were observed when the atmospheric sulfur dioxide concentration was higher at 250 m than at ground level. However, this relationship was not consistent.

60725 APTIC NO. 84665

Komichi, Masahiro and Ikuo Nabeyama

SHORT-PERIOD VARIATION OF O3 CONCENTRATION AND WIND SPEED, II. *(Ozon nodo to fusoku no tanki hendo, II). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):612, 1975. (Presented at the Japan Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 344.)*

Changes in the level of oxidants in the atmosphere at Kobe were studied in relation to changes in wind velocity on a nearby mountain top. Changes in the oxidant level were found to be related to changes in the wind velocity. When this similarity of the cycles was graphed, the phase shift between the 2 cycles tended to be 180 deg.

60726 APTIC NO. 84635

Komori, Masaki, Tetsunori Taira, and Takatoshi Tajima

INVESTIGATIONS OF ATMOSPHERIC SELF-PURIFICATIONS, REPORT. 4. ESTIMATION OF SOX AMOUNTS SCAVENGED FROM THE ATMOSPHERE IN KANAZAWA. *(Taiki no jijyosayo ni kansuru chosa kenkyu (Dai 4 Po). Kanazawashi ni okeru taikichu SOx no kyushu, shometsuryo no suitei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):135, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975.)*

The dissipation of atmospheric sulfur oxides in Kanazawa was studied under the assumptions of the Box model in order to estimate the natural SOx-cleansing effect of plants, soil, and rain. The Box assumed was 1 sq km by 500 m and meteorological data was also used in the estimation. Wind had the greatest effect of all the parameters tested. Snow and rain had the same effect on SOx removal. Since SOx removal by rainfall was high, a regression equation was used to estimate the extent of the removal which came out to 4 to 8 kg sulfur dioxide/sq km/mm rainfall.

60727 APTIC NO. 79680

Kondrat ev, K. J. and O. B. Vasil ev

SIGNIFICANCE OF AEROSOLS FOR RADIATION BUDGET AND ITS INFLUENCE ON CLIMATE. *(Die Bedeutung des Aerosols fuer den Strahlungshaushalt und sein moeglicher Einfluss auf das Klima). Text in German. Z. Meteorol., 25(3):129-142, 1975. 21 refs.*

The size and dependence on the wavelength of aerosol absorption and its significance for the radiation budget fo the atmosphere were investigated. Factors which affect the climate are discussed. A criterion is established for assessing the variation of the albedo of the system earth/atmosphere as related to the aerosol budget and composition.

60728 **APTIC NO. 80214**

Kramer, J. R.

EFFECT OF PRECIPITATION CHEMISTRY ON THE UPPER GREAT LAKES REGION. *Preprint, McMaster Univ., Hamilton (Canada), Dept. of Geology, 17p., 1975. 3 refs.*

Key parameters and considerations of atmospheric loadings are outlined. Values of nutrients, heavy metals, and other substances were collected for 5 years. Phosphorus and trace metals in precipitation exceed lake water concentrations from 2 to 10 times. Sulfur is emitted as sulfur dioxide, sulfuric acid, or acid metal sulfates. Nitrogen oxides emissions are concentrated in the Detroit-Windsor area (2.1 times 10 to the 6th power ton/yr), Chicago area (1.5 times 10 to the 6th power ton/yr), St. Louis region (0.9 times 10 to the 6th power ton/yr), and Pennsylvania (0.7 times 10 to the 6th power ton/yr). Total phosphorus emissions are associated with agriculture and heavy industry sources. Total phosphorus loadings in the Upper Great Lakes show a random pattern not associated with any source patterns. Loadings of nitrogen, P, and trace metals on Lakes Huron and Superior are large enough to affect the productivity of these lakes in the future. Both lakes have sufficient alkalinity to assimilate acid rain, although the SO4 concentration of precipitation is about 3 times that of Lake Superior. Both point and area sources contribute to loadings. Smelters at Wawa and Sudbury contribute iron, nickel, cadmium, and possibly zinc, whereas nitrate and SO4 are contribued by major United States source areas at St. Louis, Chicago, and Detroit. (Author abstract modified)

60729 **APTIC NO. 79906**

Krey, P. W., R. Lagomarsino, M. Schonberg, and J. J. Frey

HALOCARBONS IN THE STRATOSPHERE. *Health Safety Lab. Environ. Q., vol. 1975:83-105, Sept.-Dec. 1975.*

Data from the April 1975 Project Airstream mission are reported along with limited comparisons of tritium and krypton 85 with fluorotrichloromethane concentrations from the October 1974 mission. Compressed air samples were recovered from the stratosphere by aircraft. The CCl3F, carbon tetrachloride, and sulfur hexafluoride were concentrated and determined by gas chromatography. The April 1975 stratospheric inventories of CCl3F, CCl4, and SF6 were 260, 240, and 0.95 gigagrams, respectively. Based on a box model of atmospheric transport, the three stratospheric CCl3F inventories since April 1974 are compatible with a stratospheric photolysis half life of 2 to 3 years and a total atmospheric half life of 18 to 24 years. Ratios of CCl3F to Kr85 and tritium in October 1974 decrease with altitude, suggesting an increasing rate of photolysis of CCl3F with height. Ratios of CCl4, CCl3F, and SF6 suggest a stratospheric circulation pattern similar to that observed for several radioactive substances released in the stratosphere. Nearly all the reactive chlorine species below 25 km is hydrogen chloride. The HCl from the destruction of CCl3F accounts for about 30% of the measured HCl in the stratosphere. Approximately equal or greater quantities of HCl are apparently supplied by dichlorodifluoromethane and CCl4. (Author abstract modified)

60730 **APTIC NO. 83237**

Kulikov, Y. Y., E. F. Rizov, L. I. Fedoseev, A. A. Shvetsov, I. V. Kuznetsov, and E. P. Kukina

MEASURING THE OPTICAL THICKNESS OF THE EARTH S ATMOSPHERE AT THE CO AND O3 LINES (LAMBDA EQUALS 1.3-1.4 MM). *(Izmerenie opticheskoy tolshchi atmosfery zemli v liniyakh CO i O3 Lambda equals 1.2-1.4 mm). Text in Russian. Izv. Akad. Nauk. SSSR Fiz. Atmosfery i Okeana, 11(10):1071-1075, Oct. 1975. 26 refs.*

The optical thickness of the earth s atmosphere at the CO and O3 lines was measured with an allowance of 0.0027/cm (80 MHz) in order to identify peculiarities of the spectrum in the 1.3-1.4 mm zone. Two series of measurements were made. The findings indicated that the optical thickness at the center of the CO line at 230538 + or - 40 MHz lies at an interval from G(CO) equals (0.17 + or - 0.1) dB to G(CO) (0.37 + or - 0.1) dB, a conclusion which does not confirm previously noted high CO concentrations in the atmosphere. The manifested spectral peculiarities of the ozone nature in the vicinity of frequencies 231276 and 214957 MHz, the maximal values of optical thicknesses delta Gmax equals (1.34 + or - 0.3) dB and (0.33 + or - 0.06) dB emphasize the need to calculate ozone absorption when predicting the distribution conditions of radiowaves of millimeter and sub-millimeter ranges.

60731 **APTIC NO. 76496**

Kuriyan, J. G.

REMOTE MEASUREMENT OF AEROSOL PARTICLE CHARACTERISTICS AND THEIR SIGNIFICANCE TO METEOROLOGY. *Opt. Eng., 14(4):332-338, July/Aug. 1975. 14 refs.*

The remote measurement of aerosol particle characteristics and their significance to meteorology is discussed. Radiation field measurements using a polarimeter and a multispectral radiometer were used to infer the equivalent optima optical parameters of aerosol particles. Radiative effects of particulates can be calculated without ambiguity if these effective parameters are known. The theoretical models for these calculations require the interference of parameters such as optical depth, the complex index of refraction, and the equivalent size distribution. Measurements of optical depth at one wavelength (or turbidity factor) are insufficient to provide useful information for meteorological calculations and new experiments and instruments must be devised to take advantage of the theoretical developments in this field. (Author conclusions modified)

60732 **APTIC NO. 82582**

Landsberg, Helmut E.

ACTUAL AND POTENTIAL EFFECTS OF POLLUTANTS ON CLIMATE. *Preprint, Maryland Univ., College Park, 4p., 1975. 49 refs. (Presented at the Environmental Sensing and Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

Climatic effects of atmospheric pollutants are discussed. On a local scale man-made atmospheric pollutants affect sunshine, visibility, and fog frequency. Increases in condensation and freezing nuclei can be attributed to pollutants, although their effect on precipitation is not yet fully known. Pollutants also redistribute low-level temperatures in metropolitan areas. On occasion plumes can apparently cause considerable cloud banks downwind. As urban areas continue to grow, these effects begin to become measurable on a regional scale. On a global scale most anthropogenic sources of air pollutants account for a very small proportion of the total air pollution as compared to the contribution of natural pollutants. The only notable exception appears to be the continuous increase of carbon dioxide in the atmosphere as a result of fossil fuel combustion. Although this increase in CO2 is expected to lead to a global temperature rise, such a trend is not yet discernible at present. Stratospheric contamination by supersonic aircraft (nitrogen oxide emissions) and from the diffusion of fluorocarbons and their possible effect on the ozone layer are of major concern, but net solar radiation changes at the earth s surface appear to be small. (Author abstract modified)

60733 **APTIC NO. 84437**

Landsberg, H. E.

MAN-MADE CLIMATIC CHANGES. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 197-234. 303 refs.*

Inadvertent weather modifications resulting from anthropogenic emissions of carbon dioxide and particulate matter are discussed. There is no evidence that anthropogenic changes in the radiation balance are causing any significant weather changes on a global scale at present, although this may not hold in the future if CO_2 emissions double as expected. None of the models used for estimating the effects of anthropogenic activities on global temperature indicate changes of more than 2 C which is a moderate amount gauged by natural changes since the last Pleistocene glaciation. The greatest inadvertant weather modifications are occurring in urban areas on a local scale where heat islands and lower wind speed in combination with air pollutants alter cloud and precipitation patterns. As metropolitan regions grow, the climatic changes in urban areas are growing from microclimatic to mesoclimatic size. Regionally notable weather changes are also being observed in rural areas as a result of deforestation and various agricultural practices. (Author abstract modified)

60734 **APTIC NO. 76084**

Lantz, Ronald B., Antonin Settari, and Gale F. Hoffnagle

EVALUATION OF SELECTED AIR POLLUTION DISPERSION MODELS APPLICABLE TO COMPLEX TERRAIN (FINAL REPORT). *INTERCOMP Resource Development and Engineering, Inc., Houston, Tex., Office of Air and Waste Management Contract 68-02-1085, Program Element 2AC 129, Rept. EPA-450/3-75-059, 103p., June 1975. 32 refs.*

NTIS: PB 246640/AS

A comparison of three air pollution dispersion model which are applicable to complex terrain is presented. The three models are: a Gaussian calculation with terrain assumptions, the Environmental Protection Agency s valley model which substitutes different terrain assumptions into the Gaussian calculations, and a combined wind flow and plume dispersion model which uses a numerical calculation method. The last model, known as the INTERCOMP model, was developed by INTERCOMP Resource Development and Engineering, Inc. A comparison of predictions made by each of the models with measurements of ambient pollutant concentrations taken in Huntington Canyon, Utah and El Paso, Texas indicates that the INTERCOMP model possesses a predictive accuracy for terrain situations comparable to that normally expected for Gaussian predictions in flat terrain, i.e., a factor of two to three. The Gaussian calculation with terrain assumptions results in predictions which average a factor of 15 higher than the measured results for stable atmospheric conditions. (Author abstract modified)

60735 **APTIC NO. 79090**

Lantz, Ronald B. and Gale F. Hoffnagle

A COMPARISON OF PLUME DISPERSION CALCULATIONS WITH TRACER MEASUREMENTS AT HUNTINGTON CANYON, UTAH. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1975. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 68th, Boston, Mass., June 15-20, 1975, Paper 75-26.5.)*

Measurements of tracer concentrations in Huntington Canyon, Utah, a steep-walled canyon in which the ridge elevations are well above expected emission heights, were compared with plume dispersion calculations. The models consisted of two Gaussian models with corrections for topographical influences on expected windflow and a simplified hydrodynamic calculation of the windflow as affected by topography combined with a calculation of tracer turbulent diffusion. Networks of 20-30 samplers positioned throughout the canyon and at elevated positions on the sidewalls monitored 11 separate releases of sulfur hexafluoride. The calcualted results from the hydrodynamic plume diffusion model were in significantly better agreement with the measured tracer concentrations than were the results from the Gaussian models. Gaussian results were up to sixfold too high for unstable atmospheric situations where elevated releases flowed up the canyon, whereas the hydrodynamic model values were accurate within a factor of two. The Gaussian models overestimated measured tracer concentrations by more than an order of magnitude for stable atmospheric conditions where the tracer moved down the canyon. The hydrodynamic model again provided accuracy of roughly a factor of two for these stable flow tracer concentrations. (Author abstract modified)

60736 **APTIC NO. 82531**

Liou, Kuo-Nan and Takashi Sasamori

ON THE TRANSFER OF SOLAR RADIATION IN AEROSOL ATMOSPHERES. *J. Atmospheric Sci., 32(11):2166-2177, Nov. 1975. 30 refs.*

A radiation scheme has been developed by which the absorption of water vapor in the near infrared regions of the solar spectrum can be inserted into the transfer program for inhomogeneous aerosol atmospheres. The incorporation of water vapor absorption in a scattering atmosphere is accomplished by a series of exponential fits to the band absorptivity based upon laboratory measurements. Band by band calculations have been carried out for the heating rate, local albedo, total absorption, and diffuse transmission in model hazy and clear atmospheres. The distribution of heating rates in the atmosphere depends strongly upon the surface albedo and the solar zenith angle. The solar heating rates in a hazy atmosphere may be as much as 5 and 9 C/day for surface albedos of 0.1 and 0.8, respectively. Local albedo calculations for the entire solar spectrum reveal that a surface albedo of about 0.3 to 0.4 plays a significant role on the increase or reduction of a globally averaged albedo caused by the increase of aerosol concentrations in the atmospheric boundary layer. An increase of aerosol loading leads to an increase of the total absorption within the atmosphere, whereas it reduces the solar flux available to the earth s surface for absorption. Consequently, in a hazy atmosphere cooling takes place near the surface with warming aloft. The net heating effect for the earth and atmosphere depends strongly upon the surface characteristics. (Author abstract modified)

60737 **APTIC NO. 80369**

Loewenstein, Max, H. F. Savage, and R. C. Whitten

SEASONAL VARIATIONS OF NO AND O_3 AT ALTITUDES OF 18.3 AND 21.3 KM. *J. Atmospheric Sci., 32(11):2185-2190, Nov. 1975. 19 refs.*

Nitric oxide and ozone concentrations were measured in situ from a high altitude research aircraft. Data which show the variations of NO and O_3 with the time of year are presented for altitudes of 18.3 and 21.3 km. The extreme values of the observed NO concentrations at 21.3 km are 1.2 times 10 to the 9th power/cu cm in summer and 2 times 10 to the 8th power/cu cm in winter. The extreme values at 18.3 km are 1.6 times 10 to the 9th power/cu cm in summer and 1 times 10 to the 8th power/cu cm in winter. The smoothed NO seasonal data show a variation of about a factor of 2.5 at 21.3 im and a factor of 4 at 18.3 km. The ozone data show the generally expected magnitude and seasonal variation. A photochemical model employing the measured ozone concentrations, the mean solar zenith angle, and previous seasonal nitric acid data were used to predict the seasonal NO variation at 20 km. The result is a summer to winter NO ratio of 2.5 which is in fair agreement with the observed ratios. (Author abstract)

60738 **APTIC NO. 76621**

Look, D. C., Jr.

SHORT METHOD FOR THE ANALYTICAL DETERMINATION OF ATMOSPHERIC MODEL PARAMETERS. *Solar Energy, 17(4):265-267, Sept. 1975. 15 refs.*

A simple method was developed for the determination of the parameters of specific atmospheric models, given an energy measurement of direct solar flux on the earth s surface. The method, which is referred to as isoflux versus receiving angles, utilizes any analytical model of the atmosphere. The accuracy of the determination of the unknown model parameters from actual data depends upon the time variation of the unknown quantities. If the variation is excessive, these determined quantities may be in error or, at best, represent an average.

Variables include: density of dust, thickness of ozone layer, precipitable water, temperature, pressure, and radiation.

60739 **APTIC NO. 79775**

Lyons, T. J. and B. W. Forgan

ATMOSPHERIC ATTENUATION OF SOLAR RADIATION AT ADELAIDE. *Quart. J. Roy. Meteorol. Soc. (London), 101(430):1013-1016, Oct. 1975. 13 refs.*

The attenuation of solar radiation at Adelaide is estimated by a comparison of simultaneous readings taken at an urban and semi-rural site. The city contributes over 1/3 of the total turbidity. The major role of the pollutant layer is an increase in scattering rather than absorption. This is illustrated by the increased diffuse radiation observed at the urban site in comparison with a negligible variation in global radiation between the urban and rural sites. (Author conclusions modified)

60740 **APTIC NO. 82735**

MacCracken, M. C.

DOT-CIAP PROGRAM -- FINAL REPORT. *California Univ., Livermore, Lawrence Livermore Lab., Energy Research and Development Administration Contract W-7405-Eng-48, 24p., May 30, 1975. 45 refs.*

NTIS: UCRL-51336

A modelling program was carried out that focused on application to aircraft operations in the stratosphere. The aircraft engine emissions of concern included nitrogen oxides, water vapor, sulfur oxides, and carbon dioxide. The chemical reactors occurring in the dispersion regime were simulated, leading to an understanding of the quite small ozone reduction that takes place on these scales. A sophisticated numerical solution technique was modified and applied to the problem of stratospheric chemical kinetics. A two dimensional climate model was developed. The possibility that surface temperature perturbations might result from increased stratospheric aerosol loading, decreased ozone concentration, or increased water vapor mixing ratio was investigated. The effects of stratospheric aerosols on the terrestrial radiation balance were studied. The importance of the absorption of solar radiation by nitrogen dioxide in the perturbed stratosphere was assessed. The effect of atmospheric molecular scattering and of surface and cloud albedo on the photodissociation rates appropriate for the simulation of stratospheric chemistry were studied. Large scale eddy diffusion coefficients were derived to simulate the transport of tracers in the stratosphere.

60741 **APTIC NO. 82714**

Mackenzie, Fred T. and Roland Wollast

SEDIMENTARY CYCLING. MODELS OF GLOBAL PROCESSES. *Preprint, Northwestern Univ., Evanston, Ill., Dept. of Geological Sciences and Univ. of Brussels, Brussels (Belgium), Inst. of Industrial Chemistry, 96p., 1975. 103 refs.*

Factors involved in the construction of global dispersion models for the transport of pollutants are discussed. Topics covered include: transport paths between continents, oceans, and the atmosphere, transport paths between subreservoirs, problems associated with the evaluation of fluxes, steady state modeling, and the modeling of sedimentary cycles of elements. A steady state model which is successful on a long term basis for predicting sources and sinks of the major elements in the exogenic cycle and steady-state fluxes of elements among reservoirs is presented. Sedimentary cycling models are reviewed in terms of evaluating man s impact on the natural cycle of an element. Man s industrial activities are estimated to result in increased mercury vapor emissions from the land surface to the atmosphere amounting to about 2.2 times the pre-man flux. The major impact of man on the global cycle of manganese involves mining and the emission of manganese from the land surface to the atmosphere in the form of particulates. Other element cycles discussed include: silicon; iron, titanium, and aluminum; magnesium and potassium; sodium and chlorine; sulfur; and calcium carbon. (Author summary modified)

60742 **APTIC NO. 82417**

Magono, Choji and Masayuki Itasaka

OBSERVATION OF AEROSOL VERTICAL DISTRIBUTION OVER THE CITY OF SAPPORO. *(Sapporo-shi jyoku no earozoru no suichoku bunpu kansoku). Text in Japanese. Preprint, Meteorological Society of Japan, Tokyo, p. 93, 1975. (Presented at the Osaka District Meteorological Study Group, Autumn Lecture Meeting, Osaka, Japan, Oct. 29-31, 1975.)*

The vertical distribution of aerosol was measured directly over Sapporo using an airplane on March 6, 10 and 12, 1975. The aerosol concentration was measured by a Gardner counter during the ascent to 1000 m and descent to 300 m. The aerosol concentration at an altitude below 300 m was higher with four digit value/cu cm, while that of above 300 m was 300-1000/cu cm with little variation with altitude. The vertical distributions of temperature, humidity and wind indicated the absence of a temperature inversion layer, however, the wind direction was east below 500 m and south above 500 m. The existence of two air masses, one above 300 m with a lower aerosol concentration and one below 300 m with a higher aerosol concentration, was observed. The variation in vertical distribution was insufficient for the determination of the vertical distribution coefficient.

60743 **APTIC NO. 84368**

Manabe, Syukuro

THE DEPENDENCE OF ATMOSPHERIC TEMPERATURE OF THE CONCENTRATION OF CARBON DIOXIDE. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 73-77. 10 refs.*

Numerical computations on the dependence of atmospheric temperature on carbon dioxide concentration are presented. A doubling of the CO2 concentration results in a 2.3 C increase in the surface temperature of the atmosphere. A radiative convective equilibrium model of the atmosphere is used to show that a 25% increase in CO2 concentration between the years 1900 and 2000 can result in a surface temperature increase of about 0.8 C. This change may exert a significant effect on the climate of the earth s surface.

60744 **APTIC NO. 76615**

Mandics, P. A. and E. J. Owens

OBSERVATIONS OF THE MARINE ATMOSPHERE USING A SHIP-MOUNTED ACOUSTIC ECHO SOUNDER. *J. Appl. Meteorol., 14(6):1110-1117, Sept. 1975. 20 refs.*

A monostatic acoustic echo sounder with a vertically pointed antenna was tested on a ship in the Pacific and Caribbean Oceans. The scatter of sound waves in the marine atmosphere is discussed. Acoustic returns produced by turbulence-induced temperature fluctuations were received from up to 300 m in height. The data revealed the existence of a rich variety in the structure of the marine atmosphere. Thermal convective plumes were usually observed when the sea water temperature exceeded the air temperature by as little as 1 C. The acoustic returns showed layered structure, indicating more stable stratification, when the water temperature was less than the air temperature. The layered structures, associated with temperature inversions, were often perturbed by gravity waves or wind shear. Doppler frequency shift of the returned echo signals was used to estimate the vertical velocity of atmospheric scatterers. The results of the tests indicate that it is possible to probe remotely the lower layers of the marine atmosphere from a moving ship using acoustic echo sounding techniques. Noise generated by wind, ambient acoustic noise, and structure borne vibrations were the major limitations on the performance of the echo sounder. (Author abstrict modified)

60745 **APTIC NO. 82579**

Maxwell, David

THE VALIDITY OF THE LAPORTE ANOMALY: A CRITICAL REVIEW. *Preprint, Purdue Univ., West Lafayette, Ind., 24p., 1975. 25 refs. (Presented at the Purdue Air Quality Conference, Annual 14th, Indianapolis, Ind., 1975.)*

The validity of the LaPorte, Indiana weather anomaly which centers around recorded precipitation increases of 30-40% from 1927-1969 is critically reviewed. The anomaly appears to be factual and related to urban effects and industrial emissions from the Chicago-Gary Corridor. Evidence supporting the existence of the LaPorte anomaly includes: statistically significant increases in precipitation, thunderstorm days, and hail-day occurrences reported at LaPorte; the rising and falling of LaPorte's rain patterns in accordance with the Chicago-Gary Corridor steel production processes, particularly from 1923-1962; the emission of huge quantities of water vapor and dust particles in the region which are able to condense and freeze; and the washout of industrial pollutants downwind of the Chicago-Gary complex. (Author abstract modified)

60746 **APTIC NO. 83966**

McKetta, John J.

EIGHT SURPRISING FACTS ON ECOLOGY. *(8 overraskande fakta om ekologi). Text in Swedish. Sven. Vagfoeren. Tidskr., 62(5):14-15, Oct. 1975.*

Myths about certain ecological hazards are dispersed in an optimistic approach to the problems of air and water pollution, and the use of pesticides. The fears concerning the depletion of the atmospheric oxygen reserves due to the emission of air pollutants, such as carbon monoxide, are unfounded because most of the oxygen is produced in practically unlimited quantity due to photodissociation of water vapor by solar and cosmic radiation in the high atmospheric layers, while photosynthesis plays but a minor role in oxygen supply. The combustion of all organic matter on the earth would reduce the atmospheric oxygen content by merely 1%. Measurements of the CO contents over the northern hemisphere where most of the automobiles are used showed no considerable differences from the levels measured over the southern hemisphere. Atmospheric CO is destroyed by soil microorganisms. Compared with urban air, cigarette smoke and indoor air polluted with cigarette smoke contain very high concentrations of CO. About 97% of all nitric oxide and nitrogen dioxide in the atmosphere originate from natural sources, which indicates the negligible impact of automobile exhaust control measures on the atmospheric nitrogen oxides balance.

60747 **APTIC NO. 83921**

Meszaros, E. and G. Varhelyi

ON THE CONCENTRATION, SIZE DISTRIBUTION AND RESIDENCE TIME OF SULFATE PARTICLES IN THE LOWER TROPOSPHERE. *Idojaras (Budapest), 79(5):267-273, Sept.-Oct. 1975. 18 refs.*

Aircraft measurements were made over Hungary from Dec. 1972 to Sept. 1974 to determine the mass concentration and size distribution of sulfate particulates. With increasing altitude the gradient of the concentration decreased. For the middle troposphere a value of 1-2 micron was expected. The concentration measured in the lower troposphere was lower than in Germany, but higher than Swedish values. This pattern is easily interpreted by the spatial distribution of sulfur sources. The average size distribution of sulfate particulate as a function of the altitude is illustrated. The greater part of particulate sulfur was associated with very small particles. In the winter the relative amount of sulfate ions in the Aitken range increased with increasing altitude. In summer time, above 1000 m an inverse relation was found. Wet deposition rates were much higher than dry deposition. The residence time of sulfate particles in the lower troposphere and the total troposphere were similar. Residence time varied between 1-5 days.

60748 **APTIC NO. 75310**

Mills, Michael T. and Roger W. Stern

MODEL VALIDATION AND TIME-CONCENTRATION ANALYSIS OF THREE POWER PLANTS (FINAL REPORT). *GCA Corp., Bedford, Mass., GCA/Technology Div., Office of Air and Waste Management Contract 68-02-1376, Program Element 2AC 129, Task 19, Rept. EPA-450/3-76-002, GCA-TR-75-30-G, 152p., Dec. 1975. 9 refs.*

NTIS: PB 250685/AS

An analysis of the Environmental Protection Agency Single Source Model using sulfur dioxide concentration and meteorological data collected in the vicinity of three power plants in Ohio is presented. The diffusion model predicts the upper percentile of the frequency distribution of 1-hour and 3-hour concentrations reasonably well. Concentrations over the remainder of the distribution, however, are significantly underpredicted due in part to the errors in the background concentration determinations. The second highest 24-hour concentrations tend to be underpredicted by the model except at one of the plants where the model is less likely to account properly for terrain influences. Statistics for the peak 1-hour to average 3-hour and peak 1-hour to average 24-hour concentration ratios vary little from one plant to the next. (Author abstract modified)

60749 **APTIC NO. 76184**

Mills, Michael T. and Frank A. Record

COMPREHENSIVE ANALYSIS OF TIME-CONCENTRATION RELATIONSHIPS AND THE VALIDATION OF A SINGLE-SOURCE DISPERSION MODEL (FINAL REPORT). *GCA Corp., Bedford, Mass., GCA/Technology Div., Office of Air and Waste Management Contract 68-02-1376, Program Element 2AC 129, Task 5, Rept. EPA-450/3-75-083, GCA-TR-75-4-G, 153p., March 1975. 10 refs.*

NTIS: PB 250814/AS

An analysis of sulfur dioxide time concentration relationships in the vicinity of a power plant is presented along with a validation of the Environmental Protection Agency Single Source Model using concentration and meteorological data collected in the same area. The diffusion model underpredicted SO2 concentrations for each of four receptor locations used in the study area. Agreement between measured and calculated concentrations was not noticeably improved by the use of more accurate and detailed emissions and meteorological data bases. Although the model predictions were improved somewhat by the inclusion of plume rise retardation effects due to the plant structure, the model appeared to underestimate the degree of lateral plume spread. (Author abstract modified)

60750 **APTIC NO. 79719**

Misaki, Masao, Miwako Ikegami, and Izuo Kanazawa

DEFORMATION OF THE SIZE DISTRIBUTION OF AEROSOL PARTICLES DISPERSING FROM LAND TO OCEAN. *J. Meteorol. Soc. (Japan), 53(2):111-120, April 1975. 10 refs.*

The whole size distribution of aerosol particles covering the radium range from 3 nm to 2 micron was determined over the cruising course of an observation ship in 1972 and 1974 1000 km from Tokyo. The effect of dilution associated with the spatial dispersion was estimated. Subtracting the dilution factor from the apparent decay rate of the aerosol concentration, the residence time of aerosols was determined in relation to the particle size. In both expeditions the deformation of the size distribution takes place in such a way that the center of gravity of the distribution is shifted towards smaller size with the increasing age of aerosols. Sedimentation is not the primary cause of such rapid decay of large particles. Scavenging by cloud and rain drops could be most responsible for the decay. (Author abstract modified)

60751 **APTIC NO. 84439**

Mitchell, J. Murray, Jr.

A REASSESSMENT OF ATMOSPHERIC POLLUTION AS A CAUSE OF LONG-TERM CHANGES OF GLOBAL TEMPERATURE. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 149-173. 43 refs.*

The effects of atmospheric carbon dioxide and particulate matter on long term changes in global temperature are reviewed. The present atmospheric CO2 excess is estimated at 11% and is conservatively projected to increase to 15% by 1980 and 32% by 2000 as a result of increased fossil fuel burning activities. Changes in the mean atmospheric temperature that amount to about 0.3 C/10% CO2 increase appear to account for only about one-third of the observed warming of the earth between 1880 and 1940; these changes, however, appear capable of contributing a further warming of about 0.6 C between the present time and the end of the century. The total global atmospheric loading by small particles is an estimated 40 million tons at present, with about 10 million tons being either directly or indirectly due to human activities. The impact of anthropogenic particle loading changes on mean temperature cannot be reliably determined from present information, although a cooling affect is likely. A cooling trend in the earth's temperature since 1940 appears to be a natural phenomenon related to enhanced stratospheric loading by volcanic dust. Overall, the heating effect of CO2 appears to be more influential than cooling effects due to anthropogenic activities. (Author abstract modified)

60752 **APTIC NO. 84704**

Mogi, Shoichi, Kunihiro Itsui, Yoshio Kobayashi, Shuji Yuzawa, and Nobuo Umezawa

SOME FEATURES OF PHOTOCHEMICAL SMOG IN SAITAMA PREFECTURE. *(Taitamaken ni okeru kokagaku sumogu no tokucho). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):619, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 351.)*

The daily patterns of primary pollutants (nitric oxide, nitrogen oxides, sulfur dioxide, and dust concentrations) were compared with the daily pattern of oxidants. The analysis was made on days when high oxidant concentrations were observed. These locations were plotted on a line diagram. The wind direction was from the northeast. The daily pattern of dust at all locations showed two hump-like peaks, and the occurrence of the second peak was delayed at the northern location. The SO2 pattern of the northern location had a single high peak, while the patterns of the southern locations were more gentle peaks. The highest level observed at the southern locations was higher than that observed at the northern locations. The peak hour of the SO2 level was observed about 1 to 3 hr later than the second peak of the dust. The oxidant pattern was a single peak and the peak occurred at later hours, progressing from southern locations to northern locations, and the occurrence of the peak hour coincided with sulfur oxides peak.

60753 **APTIC NO. 76449**

Moore, D. J.

APPLICATION OF C.E.G.B. PLUME RISE AND DISPERSION RESULTS TO PREDICTION MODELS FOR GROUND LEVEL CONCENTRATION. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 298-319. 12 refs. (Feb. 17-21.)*

Simple boundary layer models for convective and windy conditions are used to generate equations for predicting the maximum ground level concentration of pollutants. The equations give a good representation of the ground level concentrations for all categories of wind speed and stability observed during 2500 separate 1-hour periods during a plume rise and dispersion experiment. Modifications to the expressions for predicting ground level pollutant concentrations which appear useful include the use of a wind speed at which the plume height equals 1000 m rather than a value of 1 m/sec for the calculation of the average maximum ground level concentration the lowest wind speed group of unstable occasions and the confinement of a parameter in the plume rise equation to plume rise calculations for stacks less than 120 m high. The application of the derived expressions to other locations and sources is also discussed. (Author abstract modified)

60754 **APTIC NO. 82810**

Moriguchi, Minoru, Kamotaro Nakajima, and Shinichi Sakuraba

AIR POLLUTION MODEL FOR CALM CONDITION. *(Seiondoki no taiki osen moderu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):252, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 138.)*

For pollutant concentration simulations at wind velocities less than 1 m/sec, the Puff equation is often used by setting the wind velocity at zero. A description of a new model based on the Puff model by classifying the wind velocity into three stages (0, 0.5 and 0.8 m/sec) is given, with calculation results for sulfur oxides concentrations. Based on the average SOx concentration (7:00 pm-7:00 am) obtained from Nov.-March with a high frequency of low wind velocities in Kyoto city, calculations were made using the existing Puff model with wind velocity as zero and the new model with wind velocity as 0, 0.5 and 0.8 m/sec. The relationship between calculated values and measured values was better for the new model; the values were scattered in the case of using the existing model.

60755 **APTIC NO. 83511**

Moriguchi, Minoru, Masami Fujii, and Masahiro Kanamori

UNCERTAINTIES OF AIR POLLUTION MODELING AND THEIR EFFECTS ON AIR QUALITY PREDICTIONS. *(Taiki osen yosoku ni okeru futashikasa no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):280, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 164.)*

Air pollutant concentration prediction methods have many uncertainties. The error factors involved in predictions and their effects on prediction results were investigated. Pollutant sources were classified into cases of one large smoke stack and cases with multiple smoke stacks of varied sizes. The effective stack height, wind velocity, wind direction, diffusion parameter, and attenuation of the pollutant were evaluated for their potential as sources of systematic error and random error according to the G. R. Hilst method. The predicted concentration varied greatly with effective stack height, and its effect was more prominent in a region with a higher frequency of low wind velocities. The effect of an error in wind velocity and wind direction measurements was more prominent in the case of the single smoke source. Similarly, the effect of the diffusion parameter was more prominent in the case of the single smoke source.

60756 **APTIC NO. 82923**

Muto, Naohiko and Shigeru Matsuyoshi

PREDICTION OF AIR POLLUTION BY THE BOX-MODEL. *(Bokkusu moderu ni yoru taiki osen yosoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):254, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 140.)*

Among air pollution calculation models, the plume model is used for windy states and the puff model for calm states. For the simulation of sulfur dioxide pollution in an urban area in calm states or the change-over period of sea-land breezes, the puff model is used. However, in cases when the center position of the puff is varied or when stability varies, the application of the puff model is difficult. In this study, pollutant diffusion was handled as a dynamic system comprising multi-layered boxes. Descriptions of calculation equations and calculation procedure are given. Calculation results were compared with those obtained by a plume model. The multi-layered box model was usable instead of a plume model or puff model if suitable exchange coefficients were selected.

60757 **APTIC NO. 84076**

Muto, Naohiko, Toshihisa Tanabe, and Shigenori Kuroki

PREDICTION OF ANNUAL MEAN OF THE SULFUR OXIDES CONCENTRATION. *(SOx choki heikinchi suitei ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):285, 1975. 1 ref. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 169.)*

The normal diffusion equation is generally used for the prediction of sulfur oxides concentration, while the diffusion equation based on the assumption of uniform horizontal concentration in wind direction is used for the prediction of long-term SOx mean concentration. In the case of using diffusion parameters determined for each stability, the discrepancy from the measured value is considerable, particularly in the unstable state. For the purpose of reducing such a discrepancy, the width of the vertical diffusion parameter was determined for each stability, and SOx mean concentration was obtained as the mean value within this region. Descriptions of the modified diffusion equation and calculation procedure are given. Mean concentrations at stability C, D and E were calculated by the existing diffusion equation and modified diffusion equation, and the comparison of results indicated better agreement with measured values in the case of the modified diffusion equation, reducing the height of abnormal peak.

60758 **APTIC NO. 82150**

Nagashima, Shigeru

THERMODYNAMIC ASPECTS OF AIR COMPOSITION. 1ST REPORT. NOX-N2- O2 SYSTEM. *(Taiki sosei no netsurikigakuteki kosatsu. Dai 1 po. NOx-N2-O2-kei ni tsuite). Text in Japanese. Tokyo Toritsu Kogyo Gijutsu Senta Kenkyu Hokoku (Tokyo Met.), no. 5:87-89, Dec. 1975. 7 refs.*

The equilibrated partial pressures of nitric oxide, nitrogen dioxide, nitrogen trioxide, nitrous oxide, nitrous anhydride, dimeric nitrogen dioxide, and nitric anhydride in air between 0 C and 50 C were calculated with a computer using the thermodynamic data. The equilibrated partial pressures at 25 C are 1.9 times 10 to the -10 power atm for NO2, corresponding to 0.00019 ppm; 2.7 times 10 to the -16th power atm for NO; 2.6 times 10 to the -19th power atm for N2O4; 2.0 times 10 to the -19th power atm for N2O; 3.8 times 10 to the -22nd power atm for NO3; 3.3 times 10 to the -23rd power atm for N2O5; and 2.7 times 10 to the -26th power atm for N2O3. This order remains unchanged from 0 C to 50 C, except that the partial pressure of N2O becomes higher than that of N2O4 above about 28 C. Each equilibrated partial pressure increases almost linearly with temperature from 0 C to 50 C. The partial pressure of NO2 at 50 C is 5.4 times 10 to the -10th power atm, corresponding to 0.00054 ppm. This value is two orders of magnitude lower than the present environmental quality standard for NO2 in air, 0.02 ppm. (Author abstract)

60759 **APTIC NO. 83503**

Naito, Masaki, Suehiro Otsuma, and Yoshifumi Yasuoka

MID AREA POLLUTION CONDITIONS. *(Koiki osen jokyo no patan teki haaku). Text in Japanese. Preprint, Japan Society of Civil Engineers, Tokyo, p. 57-61., 1975. (Presented at the Environmental Problems, Symposium, 3rd, Tokyo, Japan, Aug. 22-23, 1975.)*

A method to assess the pollution pattern of an extensive area is described. Dependable information on such a pattern is necessary for the regulation of total emissions and the evaluation of the effects on the environment. An extensive area is observed by point sampling at observation stations. The measurements obtained by this method have the disadvantage of being influenced by the characteristics of the sampling point. Therefore, an effort was made to study this observational error in order to assess extensive-area pollution. The collection of pollution pattern information by conventional point sampling, and by a laser radar and remote sensing are discussed. The analysis of the pollution distribution pattern was made by pattern classification and the relationship of patterns and relevant factors such as the pollution source, meteorology, season, and tide. The application of pollution distribution pattern information to environmental control of total emissions, and control of pollution emergencies.

60760 **APTIC NO. 82690**

Nakamura, Akira

MULTIVARIATE ANAYSIS OF DUSTFALL IN CITIES OF HOKKAIDO. *(Koka baijin ni tsuite no tahenryo kaiseki ni yoru ichikosatsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):600, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975. Paper 1.)*

A multivariate analysis of dustfall in 9 cities of Hokkaido was conducted to determine the compositions of the dustfall and the relationship between the dustfall and meteorological factors. The analysis was classified into yearly dustfall, winter and summer dustfalls. The result of the analysis indicates close relationship between the dustfall and meteorological factors such as monthly average temperature, precipitation and velocity of wind and that more than 65% dispersion of the major three compositions of dustfall in winter and four compositions in summer can be explained by the seasonal change of certain meteorological factors. The primary composition of the dustfall in three seasonal classifications consists of 30-40% of the total dustfall, correlates closely to the total dustfall, and relates to the seasonal change of the meteorological factors. The secondary composition of dustfall consists of 20% of the total dustfall and signifies the intensity of solubility/insolubility or precipitation/non-precipitation. The tertiary composition of dustfall consists of 11% of the total dustfall and correlates directly with sulfite and inversely with ammonia, calcium, chlorine and indicates artificial/natural origins.

60761 **APTIC NO. 84074**

Nakamura, Ken, Yutaka Tanaka, Minoru Okamura, Eiichi Okamoto, and Jun Koyama

SIMULATION CALCULATION OF CO CONCENTRATION AROUND THE INTERSECTIONS. *(Kosaten shuhen no CO nodo no keisan II). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):287, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 171.)*

The carbon monoxide concentration in the vicinity of an intersection was calculated using a plume diffusion equation for the windy state and an integrated puff equation for the calm state. The emission source at the intersection was considered as a point source, while that along the road was considered as a point source or line source depending on the wind direction. Stirring by automobiles was treated as initial diffusion and effects of buildings were taken into account. The diffusion width was estimated based on Turners method. The calculated value of 48-hour average CO concentration and measured values obtained at four intersections (44 points) at Shibuya were compared, and showed a fairly good linear relationship. The yearly average CO concentration at 5 locations (three points) obtained by simulation calculation was compared with the results of continuous measurement (r equals 0.79.)

60762 **APTIC NO. 82924**

Nakano, Michio, Noboru Mizutani, Hitoshi Kono, Kiochi Oda, Toshio Owada, Hirokatsu Nakano, Tsutomu Inoue, Kiyoshi Kondo, and Toshihiko Inoue

ESTIMATION OF AIR POLLUTION CONTRIBUTION RATE BY ATMOSPHERIC DIFFUSION CALCULATION AND ITS APPLICATION. *(V) (Taiki kakusan keisan ni yoru taiki osen kiyoritsu no suitei to sono oyo V). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):255, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 141.)*

A diffusion calculation for automotive exhaust gas (carbon monoxide, nitrogen oxides) was carried out using an SRI model with data obtained at the Asahi area in Osaka. The adequacy of the SRI model was evaluated by comparing the calculation results with measured values. Descriptions of concentration calculation equations, diffusion parameters (SRI parameter and modified Pasquill-Gifford chart) and stability classification (modified San Jose chart and Mead stability chart) are given. Input data were emission source data (CO and NOx) and meteorological data (wind direction, wind velocity, insolation quantity and cloud quantity). The CO, nitric oxide, and nitrogen oxide concentrations were measured on March 26, 28, and 31, 1975.

60763 **APTIC NO. 79478**

Nakaura, H., M. Kyoda, S. Fukuoka, and T. Ohira

DETERMINATION OF POLLUTANTS BY HELICOPTER AND ITS PROBLEMS. *(Hericoputa ni yoru osen bushitsu no sokutei to sono mondaiten). Text in Japanese. Tokyo-To Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no 6:7-13, 1975. 3 refs.*

Air in Tokyo at altitude of 300 m, 500 m, 700 m and 1000 m was sampled by sticking a teflon sampling tube from the window of a helicopter. On July 25, 1973, the ozone concentrations in the a.m. at all locations except Tokyo tower were found higher than those in the p.m. The difference in the ozone concentrations at 300 m and 500 m was very little and the difference in the concentrations in the a.m. and p.m. at 1000 m was smaller than those at other altitudes. The ozone concentrations in the a.m. on July 26 were also higher than those in the p.m., with the highest concentration appearing at 1000 m. The higher ozone concentration in the a.m. agreed with the higher ground oxidants concentration in the a.m.. Studies of the relationship between the height distribution of ozone concentration and the atmospheric stability up to 1500 m on various days showed that there were three different patterns: (1) significant decrease of ozone concentration in the stabilized layer; (2) a stabilized layer with peak ozone concentration; (3) a stabilized layer independent of the change of ozone concentration.

60764 **APTIC NO. 82780**

Nappo, Carmen J., Jr.

TIME DEPENDENT MESOSCALE WIND FIELDS OVER COMPLEX TERRAIN. *National Oceanic and Atmospheric Administration, Oak Ridge, Tenn., Atmospheric Turbulence and Diffusion Lab., Rept. 75/6, 17p., May 1975. 1 ref. (Presented at the American Meteorological Society Conference on Regional and Mesoscale Modeling, Analysis, and Prediction, 1st, Las Vegas, Nev., May 6-9, 1975.)*

Wind soundings simultaneously made at five stations over a mesoscale region of complex terrain during the Eastern Tennessee Trajectory Experiment were analyzed, vertically averaged, and interpolated over a uniform grid. During stable night time conditions, the wind field showed a marked horizontal variability which diminished with the development of a convective boundary layer. Hence, terrain effects may exert a more significant influence on mesoscale flow at night than during the day. (Author abstract modified)

60765 **APTIC NO. 80361**

Newman, L., J. Forrest, and B. Manowitz

THE APPLICATION OF AN ISOTOPIC RATIO TECHNIQUE TO A STUDY OF THE ATMOSPHERIC OXIDATION OF SULFUR DIOXIDE IN THE PLUME FROM AN OIL-FIRED POWER PLANT. *Atmos. Environ., 9(11):959-968, 1975. 31 refs.*

The rate of oxidation of sulfur dioxide to sulfate in the plume of an oil fired plant was studied by sampling with an aircraft. A mechanism was postulated for sulfur dioxide in equilibrium with water on particulates, subsequently catalytically oxidized to sulfate. Vanadium particulates, originating from the oil, were thought to serve as a catalyst. A pseudo second order mechanism depending on sulfur dioxide and particulate concentrations was indicated by the data. No dependency on relative humidity was observed. The rate of reaction was 1/ppm/hr. A technique employing isotopic ratio measurements was employed in conjunction with simultaneous concentration measurements of sulfur dioxide and sulfate. The method is based on measuring the isotopic ratio of sulfur 32 to S34 naturally occurring in the fuel sulfur. Changes were experienced in these ratios due to chemical reactions in the atmosphere. These changes were measured and interpreted in terms of an implied reaction. (Author abstract)

60766 **APTIC NO. 80489**

Nicolet, Marcel

STRATOSPHERIC OZONE: AN INTRODUCTION TO ITS STUDY. *Rev. Geophys. Space Physics, 13(5):593-636, Nov. 1975. 374 refs.*

The various reactions in which ozone and atomic oxygen are involved in the lower stratosphere, below the O3 peak, are analyzed. There is no important photochemical production of O3, but there are various possiblities for transport. The predictability of the action of chemical reaction depends strongly on important interactions between hydroxide and HO2 radicals with carbon monoxide and nitrogen oxides, respectively, which affect the ratio n(OH)/n(HO2) at the tropopause level; between OH and nitrogen dioxide which lead to the formation of nitric acid with its downward transport toward the troposphere; between nitric oxide and HO2, which lead to NO2 and its subsequent photodissociation; between Cl0 and NO, which also lead to NO2 and become more important than the reaction of Cl0 with O; between chlorine and various molecules, such as methane and hydrogen, which lead to hydrogen chloride with its downward transport toward the troposphere. (Author abstract modified)

60767 **APTIC NO. 82802**

Niimura, Hidekazu, Soji Yuya, and Yssuji Eguchi

TIME SERIES ANALYSIS OF POLLUTANTS USING THE AUTOREGRESSION MODEL. *(Jiko kaiki moderu ni yoru osenshitsu no jikeiretsu kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):433, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 174.)*

Time series analysis of pollutant data permits the preparation of efficient forecasting formulae and the analysis of data by periodic components. Descriptions of an autoregression model developed by Akaike are giiven. On the assumption that the pollutant has a local stationary source, the autoregression model was tested using daily average sulfur dioxide concentrations obtained at the Osaka Pollution Control Monitoring Center during the period of March 1969 to Feb. 1972. Total data numbered 1096, and one block comprised 548. The forecasting formula and innovation variance for the 1st and 2nd blocks are given. In both blocks, the periodic variation of one week as a unit was observed.

60768 **APTIC NO. 84075**

Nishida, Kaoru, Kazuo Azuma, Yutaka, Itakura, Masanori Kihara, and Takeo Yamamoto

PREDICTION OF AUTOMOBILE EXHAUST GAS CONCENTRATIONS AROUND HIGHWAYS BASED ON THE WIND TUNNEL EXPERIMENTS. *(Fudojikken kara mita kosoku doro shuhen ni okeru jidosha haishutsu gasu no nodo yosoku ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution, 10(4):286, 1975. 1 ref. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 170.)*

The prediction method for automotive exhaust gas concentration in the vicinity of highways based on the wind tunnel test is described. Relationships between pollutant concentration and traffic volume, wind direction and wind velocity were investigated, and the pollutant concentrations before and after the highway construction were compared. The model bench equipped with a device for simulating area pollutant sources was placed in a wind tunnel, and tested using ethane gas as a tracer. The equation for predicted concentration based on the simulation model was derived, and analyzed using the data obtained in Osaka. If the traffic volume before and after the elevated highway construction was the same, and more than 30% of traffic was diverted to the highway while less than 70% remained on the road at ground level, the environmental concentration will be reduced after the highway construction. However, if the traffic volume was increased by 25%, and less than 50% were diverted to highways, the environmental concentration was predicted to be deteriorated.

60769 **APTIC NO. 76587**

Nordlund, Goran C.

A QUASI-LAGRANGIAN CELL METHOD FOR CALCULATING LONG-DISTANCE TRANSPORT OF AIRBORNE POLLUTANTS. *J. Appl. Meteorol., 14(6):1095-1104, Sept. 1975. 23 refs.*

A quasi-Lagrangian cell method for calculating long-distance transport of airborne pollutants is described. The in-flowing air is divided into cells, which are then transported in the actual wind field. The cells are assumed to be able to absorb and give of pollutants and to be deformed. The influence of lateral diffusion which is of minor significance to long distance pollutant transport, is considered by a smoothing procedure concurrently with the analysis of the concentration field. The method is applied to sulfur dioxide transport calculations over northwestern Europe for two different 3-day periods. The calculated concentration values are in relatively good agreement with the measured values. (Author abstract modified)

60770 **APTIC NO. 84021**

Nucciotti, Francesco and Gianfranco Simonini

GROUND DISTRIBUTION OF ATMOSPHERIC POLLUTANTS AROUND THE INDUSTRIAL AREA SURROUNDING RAVENNA, CORRELATED WITH LOCAL CLIMATE AND METEOROLOGICAL PARAMETERS. *(Distribuzione al suolo degli inquinanti atmosferici intorno all area industriale di Ravenna, in relazione al clima e al fattori meteorologici locali). Text in Italian. Riv. Meteorol. Aeronautic., 35(1):3-14, Jan.-March 1975. 7 refs.*

The mean ground distribution of atmospheric pollutants around the industrial area surrounding Ravenna, Italy was investigated using sulfur oxides as tracters. The mean distribution was obtained through 5 years of continuous measurements at seven stations. It was correlated with the local circulation in the atmospheric lower layers and with the most interesting meteorological parameters.

60771 **APTIC NO. 83509**

Ogawa, Yasu

EFFECTS F SEA BREEZE ON DIFFUSION BY THE USE OF WIND TUNNEL. *(Kaifu no kakusan ni oyobosu eikyo ni tsuite no fudo fikken). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):273, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 158.)*

Air pollution in littoral industrial or urban areas was studied in terms of the effect of sea-land breezes, which cause variation in surface temperature, roughness, and stability. The effect of sea breeze on pollutant diffusion was simulated using a wind tunnel equipped with a floor which could be heated or cooled. The width of the wind tunnel was 2.3 m, and the temperature was maintained at 30 C. Using ethane as a tracer gas, the wind velocity, C2H6 concentration, Reynolds stress, and heat flux were measured. At four stabilities, (neutral, unstable, stable, and elevated inversion), the vertical concentration distribution at 25 m from the surface source (25 m from the sea coast) was measured. In the case of stable and elevated inversion, the distribution range of vertical concentration was less compared to that of other stabilities. When the pollutant source was higher than the inversion layer, and in the case of elevated inversion, the surface concentration increased about 10 times due to the fumigation phenomenon.

60772 **APTIC NO. 76186**

Ogden, Eugene C., Gilbert S. Raynor, and Janet V. Hayes

TRAVELS OF AIRBORNE POLLEN (FINAL REPORT). *New York State Univ., Albany, Environmental Protection Agency Grant 800677, Program Element 1AA009, ROAP 21ADO, Rept. EPA-650/3-75-003, 107p., Jan. 1975. 12 refs.*

NTIS: PB 247700/AS

The occurrence, transport, dispersion, deposition, and measurement of atmospheric pollen were investigated. Samplers relying on gravity or impingement did not yield data which reliably indicated concentrations per unit volume of air. Rotating impactors were usually satisfactory for general use. Filter samplers were highly variable in efficiency for particles in the pollen size range unless isokinetic sampling was attained. About 99% of the ragweed pollen was found to deposit within 1 km from its source. Dispersion into a forest from upwind sources was similar to that over open terrain, though concentrations within the forest decreased at a faster rate than in the open. Large quantities of pollen were transported in orderly fashion from their source regions, but pollen often traveled in large discrete clouds. Ragweed eradication in an area surrounded by an extensive ragweed-free area is expected to cause a marked reduction in local ragweed pollen concentrations. (Author conclusions modified)

60773 **APTIC NO. 84152**

Ohta, Shoji and Takashi Adachi

CATEGORY TO CATEGORY PREDICTION METHOD OF OX AND SOX. *(Ox to SOx no kategori, kategori yoshoku shuho). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 10(4):426, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 168.)*

Descriptions of forecasting methods for oxidants and sulfur oxides based on the quantification theory are given. The forecasting factors as well as forecasting items are classified into categories. Based on the data at 9 am, the wind factors in the afternoon of the same day are estimated, and based on the estimated wind factors, the pollutant concentration is forecasted. In the case of sulfur oxides concentrations (Kashima), the accuracy rate was 81% with model data (May-Oct. 1973) and also 81% with independent data (July-Aug. 1974). The accuracy rate of the forecasted wind factors was 71% with model data and 59% with independent data. In the case of oxidant concentration (Osaka), photochemical reactions in the diffusion process of pollutants are involved, and therefore parameters of both models are incorporated into the forecasting model. As a parameter, the diurnal range of temperature, which showed positive correlation to amount of radiation was used. Forecasting factors for oxidant concentrations were temperature and wind at 1 pm, and diurnal range of temperature and oxidant concentration at 9 am. Forecasting factors for wind at 1 pm were wind and temperature at 9 am, diurnal range of temperature and pressure gradient at 6 am. The accuracy rates were 72% and 66% for oxidants and 81% and 75% for wind at Fuse and Furitsu, respectively.

60774 **APTIC NO. 83257**

Okabe, Shinichi and Ritsu Kikuchi

RELATION BETWEEN THE LOCAL WIND SYSTEM AND THE AIR POLLUTION. 2. REGIONAL CORRELATION OF THE CONCENTRATION OF OXIDANTS. *(Kyokuchi fukei to taikiosen. 2. Okishidanto nodo no chiiki sokan). Text in Japanese. Chiba-ken Kogai Kenkyusho Kenkyu Hokoku (Bull. Chiba Pref. Res. Inst. Environ. Pollut.), no. 3:59-67, March 1975. 4 refs.*

The regional characteristics of oxidant concentrations in relation to meteorological factors were studied from statistical data of oxidant concentrations measured during April and October in 1973 and 1974 at 17 points in Chiba Prefecture. The correlation coefficients of the maximum value of the daily oxidant concentration/hour were analyzed. Regional correlations of oxidant concentration, oxidant concentration correlation and the distance between the points of measurement, regional classification and distribution patterns of the maximum oxidant concentrations, and the relation between the distribution pattern of oxidant concentrations and the regional wind direction are discussed. The statistical data indicate that the Tokyo Bay coastal area of Chiba Prefecture can be classified into four smaller areas using the regional correlation of daily maximum oxidant concentration; 15 high-concentration distribution patterns were obtained. Only a few typical patterns were related to the direction of the surface winds.

60775 **APTIC NO. 84040**

Okamoto, Shinichi, Kiyoshige Shiosawa, and Atsushi Ohtaki

AIR QUALITY SIMULATION BY ATMOSPHERIC DISPERSION MODEL. *(Kakusan moderu ni yoru taiki osen simureishion). Text in Japanese. Tenki (Weather), 22(10):9-15, Oct. 1975. 13 refs.*

Air quality simulation using an atmospheric dispersion model was made to estimate a climatological digital model to calculate the distribution of air pollution concentration and the sulfur dioxide concentration in the Keihin area was calculated by this climatological model to make a comparison with the value actually measured. A regular type plume dispersion simulation was used when there was wind, and integral type puff dispersion simulation was used during a calm period. The climatological digital model was obtained calculating the concentration of air pollutants for each and every classified meteorological condition. The result of the calculation of the SO2 concentration in the Keihin area using this model proved to be effective in estimating not only the average value of concentration but also the maximum value. The observed value of SO2 concentration at monitoring stations, K, D, and C, for example, averaged 0.089, 0.067 and 0.087 ppm, with maximum values of 0.48, 0.62 and 0.59 ppm respectively, compared to the calculated average values of 0.051, 0.094, and 0.085 ppm and the maximum values of 0.47, 0.78 and 0.42 ppm for monitoring stations, K, D, and C respectively.

60776 **APTIC NO. 84073**

Okamura, Minoru, Yutaka Tanaka, Ken Nakamura, Fujio Kimura, and Kyo Dakuju

SRI MODEL IN CROSS ROAD. *(SRI moderu no kosaten eno tekiyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution, 10(4):288, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 172.)*

The SRI model (Standard Research Institute) of Johnson et al for diffusion in street canyons is not applicable to diffusion in intersections. In this study, the SRI model was modified for application to intersections, and its adequacy was evaluated by comparison with measured values. The basic concept of modification is the overlapping of calculated values by the SRI model in the intersection. Descriptions of modification procedure and simulation calculation method are given. Correlation coefficients (1-hour value) between calculated value and measured value obtained along the road in Kanda Nishikicho were in the range of 0.74-0.91 on one side of the road and 0.78-0.90 on the other side of the same road.

60777 **APTIC NO. 82696**

Owens, Edward J.

NOAA MARK VII ACOUSTIC ECHO SOUNDER. *National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., NOAA Technical Memorandum ERL WPL-12, 75p., June 1975. 6 refs.*

The National Oceanic and Atmospheric Administration Mark VII Acoustic Echo Sounder which is a portable, monostatic instrument used to monitor atmospheric temperature fluctuations by measuring backscattered echoes from acoustic tone bursts is described. The instrument can record the height and structure of temperature inversions and convective plumes in the boundary layer to an altitude of 1360 m. The system is a unique combination of commercially available analog function modules and standard digital integrated circuits placed in sockets on printed boards for simple, trouble-free operation and easy maintenance. Complete instructions for initial set up, adjustment, calibration, startup, shutdown, and maintenance are given. Appendices include wiring diagrams, the design and operation of electronics subsystems, modifications to the system, parts lists, and schematic diagrams of circuits. (Author abstract modified)

60778 **APTIC NO. 76481**

Padmanabhamurty, B.

THE ROLE OF WIND IN POLLUTION DISPERSION. *J. Air Pollution Control Assoc., 25(9):956-957, Sept. 1975. 7 refs.*

The role of wind in the dispersion of pollutants is discussed. Maximum concentrations of pollutants have been observed under calm conditions or at very low wind velocity. Higher wind velocity was thought to improve air quality. Average concentrations of sulfur dioxide and particulates measured at representative downtown locations together with regional winds from TV towers at three Canadian stations situated in the province of Ontario for over 2 yr were used to assess the validity of this relationship. Concentrations of SO2 exceeding 10 pphm and particulates above 1 COH unit were measured. Pollutant concentrations were maximum under calm conditions and at wind velocities of 4-6 m/sec. These wind velocities were critical for high pollution sources within a city, which cause the secondary maxima of pollutant concentration. These results hold good for high pollution sources and non-inversion conditions.

60779 **APTIC NO. 82218**

Pankrath, Juergen

NUMERICAL MODELLING OF POLLUTANT AND HEAT DISPERSION IN THE VORTEX FLOW OF A CAVITY. *(Numerische Modellierung der Substanz- und Waermeausbreitung in der Wirbelstroemung einer Gelaendevertiefung). Text in German. Beitr. Physik Atmosphaere, 48(4):327-348, 1975. 16 refs.*

The separation of the atmospheric boundary-layer flow and the development of a vortex in a cavity is described by a two-dimensional model. Under adiabatic stratification of the reference atmosphere, the hydrodynamic system of equations in OBERBECK-BOUSSINESQ approximation is solved by numerical integration. The fields of vorticity and stream function show that the flow separates at the leeside wall and develops a stationary vortex in the cavity which is responsible for the resulting pressure field as well as the characteristic distribution of concentration and potential temperature. Pollutants (such as carbon monoxide) and heat which are emitted from the ground of the cavity are transferred by the circulation, thus giving higher values at the leeside than at the windward side. The circulation of air in the cavity may be characterized by the STODIECK frequency.

60780 **APTIC NO. 76394**

Partsef, D. P. and V. I. Arshinova

STUDY OF THE EFFECT OF METEOROLOGICAL AND OTHER FACTORS ON AIR POLLUTION LEVELS GENERATED BY THERMAL POWER PLANTS IN THE MOSCOW REGION. *(Issledovanie vliyaniya meteorologicheskikh a drugikh faktorov na stepen zagryazneniya atmosfernogo vozdukha ot vybrosov ryada Moskovskikh TETs). Text in Russian. Gigiena i Sanit., no. 9:98-100, 1975. 2 refs.*

The sulfur dioxide, nitrogen oxides, carbon monoxide, and dust concentrations were measured around thermal power plants burning natural gas, oil, and coal, and the dependence of these concentrations on certain meteorological factors was studied. While the SO2 and nitrogen dioxide concentrations were higher than the maximum allowable levels at the sites where the highest concentrations were measured at ground-level, the CO concentrations caused by the power plant emissions did not substantially modify the background concentration. The air pollution level was highest at 2500-3000 m distance from the stacks. The critical wind speed which causes highest ground- level concentrations at any distance, i.e., the wind speed that is too low to intensity the dispersion but is too high to reduce the thermal lift, was found to be 5-6 m/sec. High ground-level concentrations were measured in the absence of inversion and during elevated inversion, but the pollution level was low in the case of low inversion when the top of the stack was above the inversion layer.

60781 **APTIC NO. 83640**

Paugam, J. Y.

AITKEN NUCLEI FORMATION ABOVE THE COASTAL ZONE. *(Formation de noyaux Aitken dans l air au-dessus de la zone littorale). Text in French. J. Rech. Atmospheriques, 9(2):67-75, April-June 1975. 14 refs.*

Measurements taken on the northern coast of Brittany indicate that there is no trace of Aitken nuclei at low nocturnal tides; they form only at low tide during the day. However, direct and intense sunlight is not a requisite; Factors such as precipitation and turbulent state of the sea are of no consequence, nor is the amplitude of the tide an essential praameter. There is a strong correlation between the constant fluctuations in number of nuclei and the velocity and direction of the wind. This shows that turbulent mixing is very inhomogeneous and that the source of the nuclei is near the site of measurements (a dune). This points to a source at the median and lower levels of the intercoastal zone uncovered at low tide, at which time strong odors from organic substances are easily detectable. It is very likely that a number of volatile organic compounds, especially terpenes and dimethyl sulfide, are actively involved in the formation of the nuclei by photolysis in the presence of activators followed by condensation in the air above the coastal zones. These substances are probably produced by living algae which dry up during low tide.

60782 **APTIC NO. 83895**

Probald, Ferenc

RECENT TASKS OF URBAN CLIMATOLOGY. *(A varosklimatologia idoszeru feladatai). Text in Hungarian. Idojaras (Budapest), 79(2): 69-76, March-April 1975. 21 refs.*

Urban climatology forms a very important part of meteorological services concerning environmental protection. The most important field of basic research is the elaboration on the model of the urban energy balance. This includes: investigations on the specific urban water balance; surveying and mapping of the proportion of the active and inactive evaporating surfaces; clearing up the distribution and effect mechanism of anthropogenous energies. A dense station network functioning around Budapest for a definite period and data of periodical field measurements could solve several tasks of urban climatology. The computerized data processing work could examine the combinations of different climatological phenomena that affect people, and producing their multi-dimensional frequency distributions.

60783 **APTIC NO. 80205**

Pueschel, R. F. and P. M. Kuhn

INFRARED ABSORPTION OF TROPOSPHERIC AEROSOLS: URBAN AND RURAL AEROSOLS OF PHOENIX, ARIZONA. *J. Geophys. Res., 80(21): 2960-2962, July 20, 1975. 14 refs.*

The infrared absorption and scattering properties of aerosols collected over Phoenix, Arizona and vicinity were computed. Infrared in situ radiance measurements in the 9.5 through 11.5 micron spectral region result in a direct determination of the infrared volume extinction coefficient. Mie calculations based on data of size distributions and chemical composition show that at 10 micron wavelength more than 95% of the infrared extinction is caused by absorption. A comparison of the calculated with the measured aerosol absorptivity results in values for the imaginary part of the infrared refractive index of 0.47 and 0.19 for the urban and rural aerosols, respectively. (Author abstract modified)

60784 **APTIC NO. 80578**

Radok, Uwe, Neil Streten, and Gunter E. Weller

ATMOSPHERE AND ICE. *Oceanus, 18(4):17-27, Summer 1975. 8 refs.*

Atmospheric movements in the troposphere and stratosphere above the Southern Ocean are discussed. The problem in these regions center on the broad eastward air flow (the upper wasterlies) and the associated meridional circulations that help to balance the momentum and energy budgets of the southern hemisphere. The global, atmospheric circulation transports various natural and man-made substances to their ultimate deposition on the Southern Ocean and the antarctic ice sheet. The circulation of the upper troposphere is documented by direct observation with balloons, and is made visible by cloud patterns in satellite photographs. Test streams, depressions, temperature changes, the presence of ozone, and the interaction of the antarctic ice sheet with the southern ocean through the intermediary of the southern atmosphere are reviewed. Possible effects of arctic glacial activity on world climate are discussed.

60785 **APTIC NO. 76469**

Raynor, Gilbert S., Paul Michael, Robert M. Brown, and S. SethuRaman

STUDIES OF ATMOSPHERIC DIFFUSION FROM A NEARSHORE OCEANIC SITE. *J. Appl. Meteorol., 14(6):1080-1094, Sept. 1975. 31 refs.*

Studies of atmospheric diffusion from a nearshore oceanic site are described, including determining the nature of atmospheric diffusion from a representative oceanic site, relating observed diffusion patterns to meteorological and oceanographic variables, and developing models to describe such diffusion. Tracer experiments were conducted utilizing oil fog smoke released from a boat stationed from 1-3 mi offshore during onshore flows. Wind, turbulence, and temperature at several levels were measured on the beach by tower mounted instruments. Diffusion is governed primarily by water and air temperature differences. With colder water, low level air is very stable and diffusion minimal but water warmer than air induces vigorous diffusion. Measurements of plume width and height which are smaller and normalized concentrations which are larger than those predicted for the Pasquill F category were obtained.

Measured values of plume width were predicted from Eulerian measurements at the beach. (Author abstract modified)

60786 **APTIC NO. 79786**

Reiss, Jurgen

AEROMCOLOGICAL INVESTIGATIONS IN WEST-GERMANY. II. SEASONAL AND DIURNAL PERIODICITY IN THE PERIOD 1971-1972. *Zbl. Bakt., vol. 130:157-160, 1975. 10 refs.*

A study was made of the spore content of the air in Sobernheim, West Germany, from July 2, 1971 to June 9, 1972. Spores were collected on slides covered with vaseline and exposed to the air. Temperature and relative humidity were recorded. The spores on the slides were counted virtually under a microscope. The total number of spores increased in warm and dry weather and decreased when the temperature and relative humidity fell. Fungal spores were most abundant from May to the middle of October. Diurnal studies showed a maximum at 2 pm and a close correlation with climatological factors. Spores of Cladosporium were the main components of the air spores on all test days. (Author abstract modified)

60787 **APTIC NO. 82635**

Roffman, Amiram

UTILIZATION OF MATHEMATICAL MODELS AND METEOROLOGICAL DATA IN THE ASSESSMENT OF AIR QUALITY FOR FOSSIL FUELED ELECTRIC POWER PLANTS. *Preprint, Inst. of Environmental Sciences 8p., 1975. 21 refs. (Presented at the Institute of Environmental Sciences, Energy and the Environment, Annual Meeting, 21st, Anaheim, Calif., April 13-16, 1975.)*

The utilization of mathematical models and meteorological data for assessing the impact of fossil-fueled electric power plants on ground level concentrations of airborne pollutants is reviewed. Most air quality studies use a Gaussian diffusion model because of its simple form and its adaptability to simple engineering manipulations. Air quality analyses of proposed fossil fueled electric power plants consist of an evaluation of both the short- and long-term ground level concentrations of windborne pollutants. In addition to meteorological parameters, the emission inventory, stack parameters, and stack layout are important. Plant operational capacity and modes must be considered in determining the source strength. Stack parameters are used in plume rise calculations, and stack layout is used in the dispersion calculations that treat each stack as an individual source. Ambient air quality calculations performed make use of the basic plant input data, the proper diffusion climatology, and diffusion equations. Site suitability considerations must also be included to determine optimum plant design.

60788 **APTIC NO. 76145**

Rosenblum, Harvey S., Bruce A. Egan, Claire S. Ingersoll, and Michael J. Keefe

ADAPTATION OF GAUSSIAN PLUME MODEL TO INCORPORATE MULTIPLE STATION DATA INPUT. VOLUME I (FINAL REPORT). *Environmental Research and Technology, Inc., Concord, Mass., Environmental Protection Agency Contract 68-02-1753, Program Element 1AA009, ROAP 21ADO-36, Rept. EPA-600/3-75-003-a, ERT P-1121, 71p., June 1975. 8 refs.*

NTIS: PB 247564/AS

Environmental Protection Agency urban dispersion models were modified to allow for the handling of multiple station information on wind speed and direction. The Climatological Dispersion Model, a long-term averaging model, and two short-term averaging models, the Real-Time Air-Quality-Simulation Model and the Sampled- Chronological Input Model, were modified. The modifications involved developing techniques for describing wind conditions at any point within a region in which arbitrarily located observing points exist and identifying critical points in the dispersion algorithms at which the additional multiple-station wind data could be incorporated. Although no observational data were available for verifying the various approaches, applications to hypothetical meteorological situations indicated that more realistic results are obtained by the incorporation of multiple- station data. (Author abstract modified)

60789 **APTIC NO. 76146**

Rosenblum, Harvey S., Bruce A. Egan, Michael J. Keefe, and Claire S. Ingersoll

ADAPTATION OF GAUSSIAN PLUME MODEL TO INCORPORATE MULTIPLE STATION DATA INPUT. VOLUME II (FINAL REPORT). *Environmental Research and Technology, Inc., Concord, Mass., Environmental Protection Agency Contract 68-02-1753, Program Element 1AA009, ROAP 21AD0-36, Rept. EPA-600/3-75-003-b, ERT P-1121, 133p., June 1975.*

NTIS: BP 247565/AS

A user's guide for modifications to Environmental Protection Agency urban dispersion models that allow for the handling of multiple station information on wind speed and direction is presented. A description of the input, the FORTRAN IV program listing, and a test case are presented for modified versions of the Climatological Dispersion Model, a long-term averaging model, and two short-term averaging models, the Real-Time Air- Quality-Simulation Model and the Sampled-Chronological Input Model. The modifications involved developing techniques for describing wind conditions at any point within a region in which arbitrarily located observing points exist and identifying critical points in the dispersion algorithms at which the additional multiple-station wind data could be incorporated. Although no observational data were available for verifying the various approaches, applications to hypothetical meteorological situations indicated that more realistic results are obtained by the incorporation of multiple-station data. (Author abstract modified)

60790 **APTIC NO. 84267**

Roth, Rainer

THE VERTICAL TRANSPORT OF AIR COMPONENTS IN THE PRANDTL-LAYER AND THE DEPOSITION VELOCITY. *(Der vertikale Transport von Luftbeimengungen in der Prandtl-Schicht und die Deposition-Velocity). Text in German. Meteorol. Rdsch., 28(3):65-71, 1975. 12 refs.*

Mathematical treatment of vertical transport of air pollutants in the Prandtl layer on the basis of the concept of deposition velocity is presented. The vertical transport resistance adds up from a series of resistances in layers with turbulent, turbulent-molecular, molecular, and non-diffusional transport. The final passage into the surface after the non-diffusional layer is controlled by physical and chemical mechanisms. In case of labile thermal stratification, the deposition velocity undergoes an initial decrease with increasing difference in the wind velocity, and then increases with the further increase of this difference. The transport resistance in the non-diffusional layer is a determining factor for the transport of sulfur dioxide. Therefore, the use of the bulk transfer coefficient for the calculation of the SO2 transport yields too high values for the SO2 transport. A more correct calculation of the transport of SO2 and other air pollutants is possible by measuring the concentration at two different altitudes, and by determining the corresponding values of the deposition velocity on the basis of measurements of the wind speed and air temperature at the same levels.

60791 **APTIC NO. 82219**

Rott, Helmut

TURBIDITY AT AN ALPINE VALLEY-STATION. METHOD OF EVALUATION AND RESULTS. *(Die Truebungsverhaeltnisse an einer alpinen Talstation. Bearbeitungsmethoden und Ergebnisse). Text in German. Arch. Meteorol. Geophys. Bioklimatol. Ser. B, 23(4):367-408, 1975. 64 refs.*

Direct solar radiation was measured at Innsbruck in the period 1968-1972 with an actinometer equipped with OG1 and RG2 Schottfilters. From these measurements various turbidity coefficients, the size coefficient of aerosol extinction, and precipitable water were determined by numerical integration over narrow wavelength intervals. Also, from numerous actinometer measurements of the total spectrum in that period, aerosol extinction was evaluated taking into account water vapor absorption as deduced from radiosonde ascents and surface vapor pressure. Several measures of aerosol extinction or turbidity and the basis for their evaluation are discussed. The seasonal course of turbidity over Innsbruck is compared to that over other stations. The daily variation of turbidity over Innsbruck is mainly due to particulate pollution of the valley atmosphere and is influenced by local circulation. There are three distinct types of daily variation. In summer turbidity decreases markedly with the onset of a well developed up-valley wind. In fall the valley wind is only weakly developed; the change from up-valley to down-valley wind causes increased turbidity over the station. On clear winter days turbidity descreases with weak down-valley winds from sunrise until afternoon.

60792 **APTIC NO. 83232**

Rozanov, V. V. and Y. M. Timofeev

DETERMINING THE N2O AND CH4 CONCENTRATION IN THE ATMOSPHERE THROUGH INTERPRETATION OF MEASUREMENTS OF THE SPECTRAL ANGLES OF THERMAL RADIATION. *(O vozmozhnostyakh opredeleniya soderzhaniya N2O i CH4 v atmosfere na osnove interpretatsii izmereniy spektral nouglovoy struktury teplovogo izlucheniya). Text in Russian. Izv. Akad. Nauk. SSSR Fiz. Atmosfery i Okeana, 11(10):1066-1069, Oct. 1975. 8 refs.*

The theoretical possibilities of obtaining quantitative information on content profiles of nitrous oxide and methane on the basis of interpretations of radiation measurements in the range of 7-8 mkm were studied. The thermal radiation issuing from various models of the atmosphere was calculated. The investigation indicated that the thermal structure of the atmosphere had the greatest influence on the emitted radiation.

60793 **APTIC NO. 76533**

Rusch, D. W. and C. A. Barth

SATELLITE MEASUREMENTS OF NITRIC OXIDE IN THE POLAR REGION. *J. Geophys. Res., 80(25):3719-3721, Sept. 1, 1975. 4 refs.*

Nitric oxide was measured by the ultraviolet spectrometer on the polar orbiting geophysical observatory Ogo 4. Measurements of the (1.0) gamma band of nitric oxide in fluorescence show NO concentrations which are highly variable in both time and space. The average NO concentration is 3-4 times higher at high latitudes than at mid-latitudes. If auroral activity is responsible for the large NO densities and if the reaction N(2D) + oxygen is the source of NO, then auroral processes must be more efficient in the production of N(2D) atoms than dayglow processes. (Author abstract modified)

60794 **APTIC NO. 76429**

Russell, Philip B. and Gerald W. Grams

APPLICATION OF SOIL DUST OPTICAL PROPERTIES IN ANALYTICAL MODELS OF CLIMATE CHANGE. *J. Appl. Meteorol., 14(6):1037-1043, Sept. 1975. 41 refs.*

A common conclusion of several simple models of the radiative effects of aerosol layers on global climate is that the introduction of a new aerosol layer with a ratio of aerosol layer absorption to hemispheric backscattering greater than the critical value will cause a decrease in system albedo, and a layer with a ratio less than the critical value will cause an increase. Recent data on the complex refractive index and size distribution of atmospheric surface layer soil particles are used to compute values for the ratio. The resulting values are between 5 and 28. They indicate that increased generation of such airborne soil particles will tend to increase the input of solar energy to the earth and atmosphere. This heating effect results, in part, from the relatively large mean particle sizes used in the computations. The effects of particle asphericity on the computed rho values are discussed.

60795 **APTIC NO. 76220**

Ryan, A. P.

LOW LEVEL AIRFLOW PATTERNS IN CHRISTCHURCH ON NIGHTS OF HIGH AIR POLLUTION POTENTIAL. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 403-420. 8 refs. (Feb. 17-21.)*

Low level airflow patterns over Christchurch, New Zealand were studied on 18 nights of high air pollution potential during 1971 and 1972. High pollution potential was associated with surface inversions during the winter season. Wind soundings and observations of chimney smoke drift revealed three basic flow patterns: northeast, southwest, and northwest. The last type evolved during the night from either of the other two. Flow patterns were strongly influenced by topography, and little evidence for a heat island circulation was detected. In the absence of katabatic flow, the patterns were determined by the large-scale weather situation. (Author conclusions modified)

60796 **APTIC NO. 83967**

Saito, S. and H. Takeda

FORECASTING AIR POLLUTION USING ALGORITHMS. *(Sokan gyoretsu no shuseibun o mochiita taiki osen no yosoku). Text in Japanese. Preprint, Society of Instrument and Control Engineers, Tokyo (Japan), p. 17-22, 1975. 2 refs. (Presented at the Society of Instrument and Control Engineers System Symposium, Tokyo, Japan, July 10-12, 1975.)*

It is essential to be able to make accurate forecasts of pollutant concentrations. Based upon the data obtained at the Miyagi Prefectural Pollution Technology Center over the past 2 years, an attempt was made to forecast with a statistical model, using meteorological parameters. The forecast depends on measurements of changes in sulfur dioxide concentrations on the day of the forecast. Using a hierarchical cluster method, data are grouped into several classes, and relationships with meteorological factors and seasonal changes are determined. Then algorithms are calculated in each class, yielding regression models. Changes in SO2 concentrations are then used to make the forecast. Relations between pollution patterns, seasonal changes, and winds can be predicted. If a more suitable distance could be found between two points in a cluster, the relationships would be more accurate, and other meteorological factors, including wind, could be used for selection of the regression model.

60797 **APTIC NO. 82804**

Saito, Tetsushi, Atsushi Shirai, Kikuo Sensui, and Hisao Ota

METEOROLOGICAL SURVEYS FOR DAYS WHEN HIGH NOX CONCENTRATIONS APPEARED. *(NOx konodo shutsugenbi no kisho chosa). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):602, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 336.)*

Meteorological surveys were made in the Ichihara region, Chiba prefecture, Japan, from April 1974 to March 1975, on days when nitrogen concentrations exceeded 0.10 ppm. Days with high NOx concentrations were more frequent in the winter than in the summer. Localized pollution by NOx occurred more often than regional pollution (NO: 14 days, 16%; NO2: 6 days, 10%). Regional pollution by NOx occurred on days of good weather (H-type air pressure) and bad weather (F-type air pressure). Visibility was mostly bad on the days involved. The occurrence of high NO concentrations coincided with northeasterly winds and stable lower layers; the occurrence of high NO2 concentrations was associated with southerly winds and stable upper layers. Patterns of time change of NO concentrations had one or two peaks. For NO2, high concentrations continued during the day for the H-type, but peaked in the evening for the F-type.

60798 **APTIC NO. 82823**

Sakagami, Jiro

ATMOSPHERIC DIFFUSION UNDER REVERSED WIND-DIRECTION. II. *(Gyakufudoki no kakusan II). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):223, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 111.)*

Descriptions of plume diffusion equation for reversed wind direction are given, in which the concentration at x, y and z locations at time t is given in terms of the initial wind velocity U1, initial wind direction, plume emission time T, reversed wind direction and velocity of reversed wind U2. Calculations were made for completely reversed wind direction, U1 equals U2 equals 1, T equals 3600 sec and wind direction at -0.4 (stable) 0 (neutral) and -0.2 (unstable). The concentration variation with T (1, 2 and 3 hr) were also calculated, which indicated that concentration was greatly dependent on emission time T. The concentration at 175 deg change in wind direction was also calculated, which indicated that the mean concentration was reduced by one half with a 5 deg difference in wind direction.

60799 **APTIC NO. 82787**

Samson, Perry J., Garry Neighmond, and Andrew J. Yencha

THE TRANSPORT OF SUSPENDED PARTICULATES AS A FUNCTION OF WIND DIRECTION AND ATMOSPHERIC CONDITIONS. *J. Air Pollution Control Assoc., 25(12):1232-1237, Dec. 1975. 13 refs.*

Linear regression of high volume air sampler data and various meteorological parameters is used to determine the relationship between suspended particulate transport and meteorological conditions for the Albany, New York area. High particulate concentrations correlate well with southerly wind flow, regardless of the location of the receptor relative to local sources. This suggests that ambient background concentrations inherent in different air masses more consistently affect suspended particulate levels than does diffusion from local sources. Maximum particulate advection occurs under conditions of good mixing of the boundary layer and moderate wind speeds and is enhanced in the absence of removal processes such as rainout and washout. A trajectory analysis reveals a definite relationship between regional average particulate concentration and the path and origin of the wind flow. (Author abstract modified)

60800 **APTIC NO. 80354**

Sano, Akira

OPTIMAL ESTIMATION ALGORITHM FOR A DISTRIBUTED PARAMETER SYSTEM WITH MULTI-POINTWISE SOURCES. *Keio Eng. Rept., 28(5):41-55, 1975. 15 refs.*

The optimal state estimation technique is presented for a discrete time distributed parameter system perturbed by unknown inputs from multi-pointwise sources. In the proposed algorithm, the estimation procedure for the unknown inputs is separated from the estimation of the state so that the computational inaccuracy and the required memory capacity can be remarkably reduced. The new algorithm avoids the complexity in computing high-dimensional matrix equations and permits obtaining each element of the covariance separately. (Author abstract modified)

60801 **APTIC NO. 84072**

Sano, Chiharu, Eizo Takeda, Hiroaki Hashimoto, Osamu Ito, and Kisaku Wakasa

MAP OF AIR POLLUTION BY COMPUTERS. *(Denshi keisanki ni yoru taiki osenzu no sakusei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):298, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 176.)*

A method of preparation of air pollution maps based on objective estimation using data obtained at certain measurement points was developed. Descriptions of analysis theory and map preparation procedure using a multinominal model are given. The sulfur oxides and nitrogen oxides concentrations were measured at 197 measuring points in Saitama by the alkali filter paper method. Measurements were made six times during the period of September- December 1974, and the data obtained were processed using computers. Both sulfur oxides and nitrogen oxides concentrations were generally higher in Kawaguchi area, and high concentration zones were found along railroad and major highways. In the case of SOx, the high concentration region was increased from September to November, and the high concentration zone was moved southward in Decemmber, indicating the effect of monsoons. The NOx concentration showed similar tendencies, and the high NOx concentration zone was most widely spread in December.

60802 **APTIC NO. 83141**

Sasaki, Ryoichi, Takeshi Kawamura, Shigeru Sugiura, Yoshio Sato, S. Nomoto, and Toyoharu Arai

WHO: DISPERSION AND FORECASTING OF AIR POLLUTION. 4. *(WMO:Taiki osen no kishaku kakusan to yoho 4). Text in Japanese. Sokko Jiho (Weather Service Bull.), 42(9-10):293-302, 1975. 36 refs.*

Regional forecasting, urban forecasting, and pollution forecasting for a specific single source of pollutants are described. Regional pollution forecasting will be based on an existing surface observation network and a radiosonde observation network; urban scale forecasting requires additional observation sites and acquisition of information on meteorological conditions. The forecasting factors used for pollution forecasts concern dispersion efficiency, and the predictability is related to the scale of the forecast. The air pollution potential forecast is the forecast of air stagnation and relates totally to meteorological factors such as slow-moving or stagnating high atmospheric pressure, reduction of wind velocity in the lower portion of the troposphere, gentle surface winds and perpendicular limitations of dispersion. Pollution concentration forecasting services are comparatively few, and require two basic forecasting methods. One is the Moses method for statistically investigating the relation between weather conditions and the concentrations of atmospheric substances. The other method is the use of the meteorological dispersion equations of Neiburger, Wanta, or Stern to find the relation between the pollution emissions and the pollution concentrations at a certain observation site.

60803 **APTIC NO. 83248**

Sasaki, Ryoichi, Takeshi Kawamura, Shigeru Sugiura, Yoshio Sato, Shinichi Nomoto, and Toyoharu Arai

WMO : DISPERSION AND FORECASTING OF AIR POLLUTION. *(WMO : Taikiosen no kishaku kakusan to yoho, 1). Text in Japanese. Sokko Jiho (Weather Service Bull.), 42(6):185-193, 1975. 49 refs.*

Air quality depends on factors such as emission rates, transportation efficiency, efficiency of turbulent diffusion, and depletion rates of the pollutants. Prediction requires the cooperation of meteorologists and air pollution scientists. The calculation of the ultimate height reached by a plume is discussed, in which the heat emission rate of a chimney, plume velocity at the outlet of the chimney, atmospheric factors, and the lay of the land are parameters that influence the ultimate height of the plume. Theories introduced include Slawson and Csanady s theory of plume ascension by flotation, Priestley s plume ascension model, the Briggs theory, and the Gallatin and Paradise theory. Various empirical formulas are introduced and comments are given, including the formula of Moses and Carson, the formula of Holland, and the formula of Lucas. The article concludes that an accurate assessment of the effect of the heat emission rate on the ultimate height of the plume is very difficult, and that an attempt to develop a formula to calculate the ultimate height of the plume adaptable to all types of chimneys and meteorological conditions is still speculative.

60804 **APTIC NO. 80043**

Sato, J.

ESTIMATION OF TURBULENT DIFFUSIVITY OVER THE TOKYO METROPOLITAN AREA FROM CONSTANT-VOLUME BALLOONS. *Kisho Kenkyusho Kenkyu Hokoku (Meteorol. Res. Inst. Rept.), 26(2):35-46, June 1975. 13 refs.*

To study the characteristics of turbulent diffusion over an urban area, constant volume balloons with transponders were released at altitudes of 200 and 400 m, and their behavior was observed over the Tokyo metropolitan area. The atmospheric diffusivities are derived from the Lagrangian properties of the balloons, in relation to the temperature lapse rate and the turbulent intensity. The result shows that the lateral diffusivity has no direct relation to the lapse rate or the turbulent intensity. However, the vertical diffusivity is closely related to the lapse rate as well as the turbulent intensity. (Author abstract)

60805 **APTIC NO. 83513**

Sato, Junji

CONSIDERATION OF TURBULENT DIFFUSION BASED ON THE LAGRANGIAN STATISTICS. *(Lagrange teki toriatsukai ni yoru kakusan ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):276, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 161.)*

In concentration distribution simulations by atmospheric diffusion models, the surface concentrations were found to be more sensitive to numerical values than to the type of profile. Relationships between vertical eddy diffusivity and meteorological factors such as wind velocity, atmospheric stability, and turbulent intensity were investigated using data from a non-lift balloon analyzed by the Lagrangian statistical method. The r.m.s. value of the vertical velocity component showed a markedly high correlation with lapse rate, and was in good agreement with the Hass regression line. The relationship between vertical eddy diffusivity and wind velocity was not clear; however, the relationship to lapse rate was fairly clear. The vertical eddy diffusivity was clearly characterized by the turbulent intensity.

60806 **APTIC NO. 73359**

Sawada, Tatsuro and Masaki Shako

OBSERVATIONS ON FORECASTING AIR POLLUTION. *(Taiki osen yosoku ni kansuru ichi kosatsu). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 4(3):148-151, 1975. 11 refs.*

Factors influencing long range forecasting of air pollution are discussed. Sulfur dioxide pollution in the Mizushima Industrial Region, Japan, was predicted by small-sized computer calculations, based on data obtained using Sutton s model, and water tank experiments. No numerical results are given. Flow patterns observed by tracer experiments in the water tank (length, 3500 mm, width, 1700 mm, depth, 600 mm) indicated that as several smoke currents pass over various mountains of different heights, each current behaves differently. In other words, location of monitoring stations is important for obtaining accurate data. As the number of monitoring stations increases, accuracy increases.

60807 **APTIC NO. 84438**

Schaefer, Vincent J.

THE INADVERTENT MODIFICATION OF THE ATMOSPHERE BY AIR POLLUTION. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 177-196. 16 refs.*

Aircraft observations of inadvertent weather modification resulting from increased particulate loading are reported. Particulate concentrations near urban areas appear to have increased by an order of magnitude in the past 10 yr, with much of the increase being due to increased automobile usage, incineration, and electrical power generation. The most impressive field evidence of inadvertent weather modification is the overseeding of supercooled clouds which occurs over and downwind of northern cities in the United States during the winter. Lead iodide formed by the reaction of lead from automobile exhaust with airborne iodine appears to be a major source of nuclei for ice crystal formation. Changes in the precipitation and general weather of an area accompany cloud modifications. (Author abstract modified)

60808 **APTIC NO. 76280**

Schmidt, Frank

SOME NUMERICAL ASPECTS OF THREE DIMENSIONAL SPECTRAL MODELLING OF AIR POLLUTION DISPERSIOON. *(Einige numerische Aspekte der dreidimensionalen spektralen Modellierung der Ausbreitung von Luftebeimengungen). Beitr. Physik Atmosphaere, 48(3):211-220, 1975. 17 refs.*

The construction of a three dimensional spectral (polynomial) model of air pollution dispersion with local domain is outlined. Arbitrary source and wind fields, and atmospheric stabilities and inversions (all functions of space and time), are made treatable in the final state with dynamical non-linear coupling as part of the general atmospheric circulation. Numerical problems and limitations (of mainly the possible resolution) are discussed. With the present generation of computers, significant results with errors only depending on the accuracy of initial and source analysis are within reach. (Author abstract modified)

60809 **APTIC NO. 80076**

Schmidt, Frank

SOME NUMERICAL ASPECTS OF THREE-DIMENSIONAL SPECTRAL MODELLING OF AIR POLLUTION DISPERSION. *Beitr. Physik Atmosphaere, 48(3):211-220, 1975. 17 refs.*

The construction of a three-dimensional spectral (polynomial) model of air pollution dispersion with local domain is outlined. Arbitrary source and wind fields, atmospheric stabilities, inversions, and other meteorological factors, all functions of space and time, are made treatable in the final state with dynamical non-linear coupling as part of the general atmospheric circulation.

60810 **APTIC NO. 76404**

Schneider, Stephen H. and Clifford Mass

VOLCANIC DUST, SUNSPOTS, AND TEMPERATURE TRENDS. *Science, 190(4216):741-746, Nov. 1, 1975. 32 refs.*

The effect of volcanic dust and sunspot activity on the general pattern of global surface temperature since 1600 AD was calculated using a simple climatic model. Volcanic dust veils are an external cause of climatic change primarily because they can screen out several percent of the direct solar beam, thereby preventing some of the solar energy from reaching the lower atmosphere. A relationship between increases in volcanic dust concentrations and effective decreases in the solar parameter is defined which is scaled proportional to the dust increase. The dust veil index compiled from a combination of historical accounts and direct measurement of volcanic contributions to the stratospheric aerosol is used along with observations from Mauna Loa Observatory in Hawaii.

60811 APTIC NO. 79741

Schneider, Stephen H. and Roger D. Dennett

CLIMATIC BARRIERS TO LONG-TERM ENERGY GROWTH. *Ambio, 4(2):65-74, 1975. 42 refs.*

The effects of carbon dioxide, dust, and thermal pollution on global climate are discussed. Carbon dioxide and dust alter the radiative properties of the atmosphere and affect the heat balance and the climate. State of the art climate models predict a doubling of CO2 will occur by 2040 and raise the surface temperature by 2-3 K globally. It is unclear whether dust (aerosols) from fossil fuel combustion have a globally significant direct effect on the earth s radiation balance. It is less clear that increases in aerosols indirectly affect climate by altering the structure or optical properties of clouds. Pollution power densities in urban areas cause a variety of local climatic changes. As the scale of urbanization and energy production and consumption increases, the scale of influence of heat pollution grows from urban scale to mesocale (10-100 km). Thermal pollution from continued energy growth, together with the potential warming from the doubling of atmospheric carbon dioxide, could result in global climatic changes greater than any that have occurred since the last ice age.

60812 APTIC NO. 82530

Schneider, Stephen H.

ON THE CARBON DIOXIDE-CLIMATE CONFUSION. *J. Atmospheric Sci., 32(11):2060-2066, Nov. 1975. 31 refs.*

A number of estimates of global surface temperature sensitivity to a doubling of atmospheric carbon dioxide to 600 ppm are collected and critically reviewed. The assumptions and formulations that lead to differences between certain models estimates are explained in some detail. A simple one dimensional globally averaged model of the earth and atmosphere that accounts for mutual adjustments (through vertical heat transports of radiative, sensible, and latent energies) among the stratosophere, troposphere, and surface, and assumes a constant tropophospheric relative humidity profile is, perhaps, the most reasonable available quantitative estimate of the sensitivity of the mean global surface temperature to increases in CO2. Based on current understanding of climate theory and modeling, a state of the art estimate for the global surface temperature increase from a doubling of atmospheric CO2 content is between 1.5 and 3 K, with an amplification of the global average increase in polar zones. This estimate may prove to be high or low by severalfold as a result of climatic feedback mechanisms not properly accounted for in state of the art models. (Author abstract modified)

60813 APTIC NO. 79825

Schubert, J. F.

A SHORT CLIMATOLOGY OF THE ATMOSPHERIC BOUNDARY LAYER USING ACOUSTIC METHODS. *E. I. du Pont de Nemours and Co., Aiken, S. C., Savannah River Lab., Energy Research and Development Administration Contract AT(07-2)-1, 20p., June 1975. 17 refs.*

NTIS: DP-1385

An acoustic sounder used for measuring the height of the boundary layer of the atmosphere is described. The atmospheric phenomenon as depicted on the facsimile recorder is classified and then placed into one of sixteen categories. The height of the boundary layer is then measured. Frequency tables of boundary layer height and category are created from this information. (Author abstract modified)

60814 APTIC NO. 83972

Seemann, J.

COOLING TOWER VAPORS ARE HARMLESS. *(Kuehlturmschwaden unbedenklich). Text in German. Umschau Wiss. Tech., 75(24): 746, 1975.*

The effect of cooling tower vapors on agriculture and climate is examined. A medium sized (1500 MW) power station and a large power station (25,000 MW) give off water vapors at the rate of 72,000 tons and a million tons per day, respectively. The total water vapor content of the atmosphere over West Germany from 0 to 10 km height is 4000 million tons, and the national daily precipitation is 500 million tons. This means that the water vapor from cooling towers comprises a negligible portion of the total water vapor in the atmosphere and only 1/500 of the total precipitation. Any dimming of sunlight due to cooling tower vapors is negligible, thus plant growth in the area of the power station is not affected. As for increases in relative humidity and rainfall near cooling towers, the former can increase from .25 to .62% or in case of fog formation 4% for brief periods, and the latter can show an increase of 1%. Thus cooling tower vapors have a negligible effect on climate and local plant growth.

60815 APTIC NO. 82928

Seki, Kiyonori

CALCULATION RESULTS OF PASQUILL STABILITY. *(Pasudiru anteido no shisan kekka). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):250, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 136.)*

Emission control based on the total emission quantity control method is now included in the Air Pollution Control Law. Calculation methods for total emission quantity under the environmental standard are being developed. A calculation method for Pasquill stability, based on meteorological data, was developed. Descriptions of the Pasquill stability equations for day and night, obtained by assigning corresponding stability to each insolation block, cloud amount, cloud form block, and wind velocity block in Pasquill s stability table are given. Stabilities obtained by calculation and simulation were compared, and discontinuous variations in stability were observed in the systematic seasonal and diurnal variations corresponding to the change of seasons and sunrise and sunset. The adequacy of the calculation method was verified by comparison with simulation results.

60816 APTIC NO. 80094

Sharma, V. and L. O. Myrup

DIFFUSION FROM A LINE SOURCE IN AN URBAN ATMOSPHERE. *Atmos. Environ., 9(10):907-922, Oct. 1975. 16 refs.*

A model for the diffusion of material from a line source in an urban atmosphere is presented. The plume is assumed to have a well defined edge at which the concentration falls to zero. The vertical wind shear is accounted for by using a power law, the exponent of which is explicitly determinable as a function of surface roughness characteristics of the terrain and the stability of the atmosphere. The concentrations estimated from the model compare favorably with the field observations of other investigators. (Author abstract)

60817 APTIC NO. 76581

Shaw, Glenn E. and Charles S. Deehr

A PHOTOELECTRIC CORONAMETER FOR ATMOSPHERIC TURBIDITY STUDIES. *J. Appl. Meteorol., 14(6):1203-1205, Sept. 1975. 10 refs.*

A photoelectric coronameter which allows accurate measurements of the sky radiance to be made in the aureole region was developed. The instrument is designed to evaluate, quantitatively, the sky brightness and its gradient at angular distances of less than 6 deg from the solar limb. Measurements of the brightness gradient and absolute radiance in the solar aureole can be used to infer information about the size distribution of aerosols. The instrument has potential application in background aerosol monitoring and air pollution studies. (Author abstract modified)

60818 **APTIC NO. 84071**

Shigemitsu, Kazuyuki and Tsuneo Tsukaya

STATISTICAL MODEL FOR THE FREQUENCY DISTRIBUTION OF AIR POLLUTION CONCENTRATION. *(Taiki osen nodo bunpu no tokei modery). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):295, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 178.)*

The frequency distribution of air pollutant concentration is a non-normal type. The statistical model of pollution mechanism in the case of single pollutant source was developed. Descriptions of the model and equations for pollutant concentration at a given observation point, frequent distribution in a given wind direction, simultaneous probability density function, and pollutant concentration frequency distribution are given. Calculation results of theoretical concentration frequency distribution at a given observation point in the case of constant wind velocity are given, and this model was classified as a beta distribution type based on Pearson s evaluation method. The wind velocity distribution model was prepared using data obtained at Osaka during the period of Jan.-June 1972, and the concentration distribution was calculated for each wind velocity. Based on the wind velocity frequency, the concentration distribution taking into account the wind velocity was obtained.

60819 **APTIC NO. 82801**

Shimanuki, Mitsujiro, Ken Yoshida, and Kazuo Sato

PREDICTION OF AIR POLLUTANT CONCENTRATION. *(Taiki osen yoho ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):423, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 165.)*

The effects of various meteorological factors on sulfur oxides concentration were investigated using data obtained from May to September 1973 and April to September 1974 at five weather stations in Fukushima. The relationship between maximum SO2 concentration and wind direction, wind velocity, temperature, humidity, vertical temperature difference (86, 120, 160 m), insolation intensity, cloud presence, and pressure was analyzed by single correlation, multiple correlation, multiple regression equation, contribution rate of regression, and regression coefficient. The wind direction, temperature, and vertical temperature difference generally showed higher correlations, and the accuracy of forecasting depended greatly on the accurate estimation of these three factors. The measured and estimated SO2 concentrations were in fairly good agreement.

60820 **APTIC NO. 82809**

Shimogata, Shigeo

SMOKE CONCENTRATION IN THE CASE OF DISPERSION WITH SEDIMENTATION. *(Chinchaku no aru baaino kemuri no nodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):251, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 137.)*

Pollutants in the atmosphere are removed by natural cleansing processes. According to Garland (1974), discussing sulfur dioxide, 25%, of the total emissions are removed by sedimentation, while 0.7% are dissolved in rain and removed. The surface concentration of smoke, which disperses with a simultaneous sedimentation process, was calculated using a modified plume equation. Sedimentation rate equations and modified plume equations for smoke dispersion are given. Calculation results indicated that the surface concentration of smoke was reduced linearly with distance from the smoke source. At a sufficient distance from the smoke source, the smoke concentration from the higher smoke source was higher than that from a lower smoke source, and the sedimentation quantity was higher at a higher sedimentation rate.

60821 **APTIC NO. 79604**

Shinra, K.

DIFFUSION CALCULATION EQUATION AND SELECTION OF DIFFUSION PARAMETER. *(Kakusan keisanshiki to kakusan parameta no erabikata ni tsuite). Text in Japanese. Kankyo Gijutsu (Environ. Converv. Eng.), 4(9):643-650, 1975.*

The purpose of diffusion calculations is to find the correlation between pollutant emission quantity and environmental concentration. If the input on the pollutant source and the meteorological data are accurate, a calculated value which is in good agreement with the measured value should be obtained by selecting an appropriate diffusion model. Descriptions of diffusion equations based on the plume model and puff model, Sutton s equation, long range average concentration equation and equations for line and area sources are given. Pasquill s diffusion parameter for plume models, Singer, Smith et al s diffusion parameter, and Sutton s diffusion coefficient and diffusion parameters for the puff model are discussed. Altitude variations on wind velocity and appropriate diffusion parameters are also discussed. The calculated value and measured value of sulfur dioxide concentration were compared, and the adequacy was evaluated in terms of regression line (gradient 0.8-1.2), correlation coefficent (higher than 0.71, preferably higher than 0.8), and concentration pattern.

60822 **APTIC NO. 82901**

Shiozawa, Kiyoshige and Jun Hiroo

PREDICTION BY TIME SERIES. *(Jikeiretsu ni yoru yosoku). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):424, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 166.)*

Air pollutant concentrations were treated as a time series, and the possibility of pollution prediction based on the periodic character of a time series was evaluated. Descriptions of time series, a method of finite Fourier transformation, and a calculation method are given. For the one-hour values of nitric oxide (Itabashi, July 1972), sulfur dioxide (Kojiya, July), nitrogen dioxide (Kokustu, Aug.), and oxidant (Shakuji and Tachikawa, Aug.), the measured values were compared with predicted values. The correlation coefficients of measured values and predicted values were 0.62, 0.68, 0.69, 0.70, and 0.89, respectively.

60823 **APTIC NO. 84382**

Singer, S. Fred

ENVIRONMENTAL EFFECTS OF ENERGY PRODUCTION. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 25-44. 36 refs.*

The environmental effects of fossil fuel and nuclear energy production are discussed, with particular reference being made to increases in global carbon dioxide and the generation of waste heat. Carbon dioxide is the only combustion product whose increase on a worldwide basis is documented. The CO2 concentration for the year 1960 is estimated to be about 315 ppm as compared with a base level of 290 ppm for the year 1890. Average annual increases of about 0.2% of the 1960 level are projected. Although increasing CO2 concentrations are capable of causing an elevation in the atmospheric temperature, the effect of CO2 on the climate is uncertain because of a lack of reliable worldwide radiation measurements and the interfering effects of changes in cloudiness and atmospheric turbidity. The dissipation of waste heat is the major problem associated with human energy production. Aside from its warming effect on the atmosphere, waste heat is also responsible for changes in the convective pattern of the atmosphere.

60824 **APTIC NO. 84381**

Sisler, F. D.

IMPACT OF LAND AND SEA POLLUTION ON THE CHEMICAL STABILITY OF THE ATMOSPHERE. *In: The Changing Global Environment. S. Fred Singer (ed.), Boston, Mass., D. Reidel Publishing Co., 1975, p. 57-71. 54 refs.*

The impact of technology and population growth on land and sea pollution and in turn on the chemical stability of the atmosphere is discussed. The chemical composition of the atmosphere is controlled to a large extent by biogeochemical cycles existing on land and in the seas, and over one-half of the natural constituents of the atmosphere originate from the hydrosphere. Upsets in the ecological balance, as typified by changes in photosynthesis and respiration processes of marine plankton, are considered in terms of possible changes in atmospheric levels of oxygen, nitrogen, and carbon dioxide. Although a major disruption on a global scale is not apparent, subtle changes may be occurring which could have far-reaching consequences in the future. (Author abstract modified)

60825 **APTIC NO. 84414**

Slade, D. H., R. W. Beadle, and R. Newell

CHEMIST METEOROLOGIST WORKSHOP--1975. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research, Rept. ERDA-1217-75, 100p., 1975. 47 refs. (Presented at the Chemist/Meteorologist Workshop, Ft. Lauderdale, Fla., Jan. 13-17, 1975.)*

NTIS: WASH 1217-75

Panel reports on sulfur air pollution presented at the 1975 Chemist Meteorologist Workshop are presented. The reports include: sulfur budgets on multistate scales including problems in the assessment of atmospheric sulfur transport, monitoring, parameterization, and modeling; chemical and physical transformation; and measurements required to characterize the formation and decay of sulfur. Other reports include: the role of aerosols in producing inadvertent weather and climate modification. The contribution of meteorologists and atmospheric chemists to epidemiological studies, and the use of high sulfur fuels.

60826 **APTIC NO. 83228**

Smirnov, B. M.

ECOLOGICAL PROBLEMS OF THE ATMOSPHERE. *(Ekologicheskie problemy atmosfery zemli). Text in Russian. Usp. Fiz. Nauk, 117(2): 313-332, Oct. 1975. 110 refs.*

Some concrete problems concerning the effect of industrial operations on the properties of the earth s atmosphere are examined. Atmospheric contaminating ensuing from power engineering can affect the earth s thermal balance. Industry is presently in a position to manufacture a sufficient quantity of chemically active substances to create intolerable living conditions for man in certain areas of the globe. Changes in the composition of atmospheric mixtures can also change the direction of the influence of the nitrogen cycle on the balance of atmospheric ozone. The level of the effect of industrial activities on the atmosphere is ascertained primarily according to energy losses.

60827 **APTIC NO. 84401**

Sobolev, Igor

FLUOROCARBONS AND OZONE: FACTS AND ASSUMPTIONS. *Preprint, The Packaging Inst., 11p., 1975. (Presented at the Packaging Institute Seminar, Sept. 23, 1975.)*

The release of fluorocarbons into the troposphere and its effect on ozone are discussed. The atmosphere contains 70-100% of world production of fluorocarbons. If it is 70%, O3 depletion is 0.4 that predicted by current models. Fluorocarbons 11 and 12 are found up to 35 km, but the assumed diffusion coefficients are not confirmed. Fluorocarbon 11 and 12 break down under ultraviolet light to yield chlorine. This reaction is not observed directly into the stratosphere. The decomposition of O3 by chlorine in real or simulated stratospheric environment has never been measured. The existence of side reactions deactivating Cl2 or yielding more O3 has not been disproven.

60828 **APTIC NO. 82527**

Soeda, Takashi

AIR POLLUTANT MODELS AND PREDICTIONS. *(Taiki osenshitsu moderu to yosoku). Text in Japanese. Preprint, Society of Instrument and Control Engineers, Kansai Section, p. 24-37, 1975. 20 refs. (Presented at the Determination of Environmental System and Modeling Symposium, Osaka, Japan, Sept. 18, 1975.)*

Predictions of atmospheric pollutant concentrations were calculated from non-physical models, based on multiple recurrent models and self- recurrent models, with suitable modifications with the Kalman filter. Calculated data from these models were compared to actual measurements of oxidant, nitric oxide, nitrogen dioxide, sulfur dioxide, and carbon monoxide in a ward in Tokyo, during October-December 1971. Measured data had been observed hourly each day; data for mathematical formulations were chosen from those days when there was more than 5 hours of sunshine (55 days). For time periods ranging from 24 hours to 50 days, there was good agreement between the calculated and observed values.

60829 **APTIC NO. 84709**

Soga, Yoshiro, Ryo Matsumoto, Hiroshi Hayashi, Shigehiro Tazuya, Sakutaro Mori, Yoko Nakamura, Akitoshi Ishikawa, Michi Hatofuji, and Yoshio Toomi

HIGH OXIDANT CONCENTRATION IN NIIHAMA CITY, EHIME, JAPAN, REP. II. HIGH OXIDANT CONCENTRATION AND POLLUTANTS. *(Ehimeken niihamashi ni okeru konodo okishidanto. 2. Konodo okishidanto to ichiji osen busshitsu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):623, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 356.)*

Atmospheric nitrogen dioxide, total hydrocarbons, and sulfur dioxide levels were considered in relation to the oxidant level at two locations in Niihama City. The daily NO2 level changes were classified into three categories: A, having one peak around noon; B, having two peaks in the level occurring around noon and in the evening; and C, having one peak in the evening. The daily SO2 level changes were within class A, while daily total hydrocarbon level changes were within class C. The daily NO2 pattern tended to follow category A on days with a maximum daily oxidant level greater than 6 pphm. The average oxidant level on days with this (class A) pattern for NO2 was 9.3 pphm. The tendency of the occurrence of this pattern changed to class C and then to B on days with high oxidant levels; for classes C and B the average oxidant levels were 7.5 and 6.1 pphm, respectively.

60830 **APTIC NO. 80113**

Sojima, J. and M. Hanyu

AIR POLLUTION ANALYSIS OF AUTOMOBILE EXHAUST. *(Jidosha haiki gasu no taiki osen kaiseki). Text in Japanese. Kankyo Sozo (Environ. Creation), 5(9):26-34, Sept. 1975. 3 refs.*

An air pollution analysis system consisting of two major phases was developed. Phase 1 estimates the automotive emission by calculating the emission in the road network and transforming it into emission per unit mesh of the road network.

Phase 2 uses the results of phase 1 as input and solves a diffusion equation at given meteorological conditions including wind direction, wind velocity, and height of inversion layer. The system was employed for a case study on carbon monoxide emission in Tokyo on Oct. 19, 1974. The specific numbers at about 150 major intersections in the metropolitan area were used for the calculation in the calculation phase 1. Results of the analysis were in good agreement with the observations.

60831 APTIC NO. 82240

Sonobe, Yoshinao

SURVEY OF AIR POLLUTION FORECASTS (REPORT NO. 3). ON PHOTOCHEMICAL SMOG IN YOKKAICHI CITY. *(Taiki osen yoho chosa (Dai 3-ho). Yokkaichi no kokagaku sumoggu ni tsuite). Text in Japanese. Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes, Tokyo Dist. Meteorol. Obs.), no. 8:78-80, Sept. 1975. 10 refs.*

Data on lower layer atmospheric conditions, land and sea winds, and maximum mixing depths (MMD) of Yokkaichi City, were tabulated and analyzed, for the summer of 1973 and 1974. During August 2-6, 1974, three inversion layers formed (near the ground layer); at altitudes of 150-300 m; and 400-1200 m), localized in the Yokkaichi region. On August 3 and 5, a fourth layer formed above the other three. Temperatures of these inversion layers were 298 K, 300 K, 302 K, 304 K, respectively, with increasing altitudes. On August 3, when altitude of MMD was 1180 m, and coincided with the upper transition layer, oxidant (Ox) concentration was high (0.248 ppm). Maximum Ox concentrations during this period ranged from 0.155-0.248 ppm; average Ox concentrations, from 0.060-0.105 ppm. Horizontal diffusion of Ox with wind direction showed high Ox concentrations with sea winds. When virtual MMDs were calculated from the atmospheric data for July and August 1973 and 1974, correlations with maximum temperatures and Ox concentrations were discerned. The highest Ox concentrations tended to occur at maximum air temperatures of 32-34 C, and virtual MMDs ranging from 1200-1500 m.

60832 APTIC NO. 80228

Sprunger, Russel R. and Lawrence E. Wangen

NUMERICAL STUDIES ON THE SENSITIVITY OF THE AIR QUALITY ASSESSMENT MODEL TO POTENTIAL ERRORS IN MODEL PARAMETERS. *Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div., Proj. AFWL 75-PO-071, 42p., Aug. 1975. 5 refs.*

The sensitivity of the Air Quality Assessment Model s predicted hourly pollutant concentrations to potential errors in input parameters was assessed. A set of input parameters representative of morning April conditions at Williams Air Force Base, Arizona, was used to define a set of reference concentrations at a grid of uniformly spaced receptors. Each parameter was changed while holding all others constant and comparing the model outputs before and after the change. The model concentrations are very sensitive to potential errors in wind speed, vertical diffusion coefficients, and stability; and to a lesser degree to errors in wind direction. Sensitivity to other parameters is not nearly so great. (Author abstract modified)

60833 APTIC NO. 76443

Steiner, J. T.

APPLICATIONS OF THEORY TO THERMAL POWER STATION PLUMES. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 361-380. 14 refs. (Feb. 17-21.)*

Theories of atmospheric plume behavior are reviewed for both calm and windy conditions and are applied to observations of a plume from the stack of a steam electrical generating station. Plume behavior can be predicted quite accurately during calm and windy conditions with neutral stability; although during windy stable conditions, plume rise is less than that predicted by theory. During calm conditions, large updrafts can occur in power station plumes up to quite high levels and possibly cause turbulence affecting aircraft operations. Appreciable effects on plume rise are exerted by even very light winds, and neither the vertical nor the bent-over plume model are applicable over a certain range of very light winds. (Author conclusions modified)

60834 APTIC NO. 80364

Stukel, J. J., R. L. Solomon, and J. L. Hudson

A MODEL FOR THE DISPERSION OF PARTICULATE OR GASEOUS POLLUTANTS FROM A NETWORK OF STREETS AND HIGHWAYS. *Atmos. Environ., 9(11):990-999, 1975. 30 refs.*

A mathematical model has been developed for predicting the atmospheric transport of particulates of any size distribution and of gaseous pollutants. The sources are finite length line segments representing a network of city streets and rural highways. The model can be used to predict the dispersion of pollutants in any region of flat terrain. The inputs required for the model are the coordinates of the highway segments, traffic counts, and meteorological conditions. The model has been used to estimate the distribution, in the vicinity of Urbana-Champaign, Illinois, of lead emitted from automobiles. The region has an area of 168 sq mi and includes both rural and urban sources. (Author abstract modified)

60835 APTIC NO. 80047

Sullivan, Edward C.

EVALUATING AIR POLLUTION IMPACTS OF TRANSPORTATION. *Transp. Eng. J. Proc. Amer. Soc. Civil Eng., 101(TE4):763-779, Nov. 1975. 46 refs.*

Methods for air quality impact estimation and evaluation in urban transportation planning are reviewed. Current emission factors are suitable for mesoscale analysis but are difficult to apply to microscale analysis due to their reliance on standard driving cycles, rather than actual vehicle operating modes. Microscale diffusion models that estimate the effects of emissions on local air quality are available from several sources and given reliable results. They should be used in sensitive areas to analyze transportation intrastructure alternatives. Mesoscale diffusion models estimate pollution concentrations at various locations in an air basin exit, but are not accurate. They are unable to model the formation and transport of photochemical oxidants. The most desirable evaluation method available is to employ cost-effectiveness analysis and other analogous types of tradeoff analysis.

60836 APTIC NO. 76527

Suomi, Verner E., Stewart Borland, H. Donald Burbank, Anthony Copp, H. Frank Eden, Peter Gilman, Glenn R. Hilst, Cecil E. Leith, Jr., Paul B. MacCready, Jr., and James R. Mahoney

ATMOSPHERIC RESEARCH FOR THE NATION S ENERGY PROGRAM. *Bull. Am. Meteorol. Soc., 56(10):1060-1068, Oct. 1975. 8 refs.*

Areas where improved weather science and technology offer potential for a particularly large benefit to the national energy picture are identified. Those parts of various energy systems that are especially sensitive to weather variability are identified. Energy policy, meteorology and energy in agriculture, and weather modification are considered. Attention is focused on those aspects of the atmospheric sciences that could contribute substantially to improved utilization, efficiency, and conservation of future energy systems and resources. Clouds are an important area of observation for climate physics. Weather forecasting is discussed, including severe storm forecasts. Increased basic research is recommended in the following areas of the atmospheric sciences: short range and long range specification and prediction of weather variables directly related to energy system operations; atmospheric dispersion and chemical transformations of pollutants, particularly in the planetary boundary layer; the control of radiation and temperature through cloud modification; and micrometeorological and microclimatic effects on agricultural productivity and efficiency. (Author abstract modified)

60837 **APTIC NO. 82501**

Super, Arlin B., Jack T. McPartland, and James A. Heimbach, Jr.

FIELD OBSERVATIONS OF THE PERSISTENCE OF AGI-NH4I-ACETONE ICE NUCLEI IN DAYLIGHT. *J. Appl. Meteorol., 14(8):1572-1577, Dec. 1975. 23 refs.*

A field method of estimating the persistence of a commonly used silver iodide seeding agent is described and applied at three separate locations, during different seasons, and with various degrees of cloudiness. The method involves measurement of the AgI plume structure at two downwind distances from the ground generator. Distances between the nine available pairs of downwind measurement planes ranged from 10 to 100 km. An NCAR acoustical ice nucleus counter in a light twin aircraft was used to sample the AgI plumes. A series of passes was made through the entire vertical and horizontal extent of the plume at each downwind distance. These measurements, together with pilot balloon observations, permitted calculation of the flux of AgI through each vertical cross section plane. The difference in flux measurements yielded an estimate of the persistence of the seedling agent over the period of transport between the two vertical planes. Resulting estimates of deactivation rates of the ice nucleating ability of AgI ranged from no loss to 70% loss/hr. (Author abstract modified)

60838 **APTIC NO. 82433**

Suzuki, M. and R. Komabayashi

FORMULAS FOR CALCULATING PLUME RISE AT THERMAL POWER PLANTS---PLUME RISE IN WINDY CONDITIONS---. *(Karyoku hatsudensho kara no haien jyosho takasa---Yufudoki no haien jyosho takasa shokeisanshiki). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Daiichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind. Rept.), no. 74135:1-52, June 1975, 23 refs.*

Theoretical and empirical formulas for calculating the plume rise of stack gas are discussed. About 30 formulas are known; however, the calculation results are not necessarily in agreement. Such disagreement is attributed to differences in the analytical method, factor selection method, measurement method, and the definition of maximum rise. Several known plume rise formulas, primarily empirical, were selected and evaluated concerning such factors, and characteristics of each formula are discussed. The formulas evaluated are Briggs; T.V.A.; Moses and Carson; Lucas; Moore and Spurr; CONCAWE; C.E.R.L. (England); C.R.I.E.P.I. (Japan), and others. The selection criteria for an optimum formula are discussed.

60839 **APTIC NO. 84707**

Takeuchi, Junichiro, Kenji Yoshimoto, Kazumi Koike, and Ichiro Kojima

OXIDANTS CONCENTRATIONS AND METEOROLOGICAL CONDITIONS IN AICHI (REPORT 2). *(Aichiken ni okeru OX konodo to kishojokyo ni tsuite 2.). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):611, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 343.)*

During 1974, high oxidant levels in Aichi Prefecture were studied in relation to wind direction. High oxidant levels over a wide area in the prefecture occurred relative to changes in the wind direction from land to sea (they occurred on days when the weather fronts changed to northerly). The direction of the wind from June through September was classified into three major categories. The points at which the wind centered (no net wind direction) showed high oxidant levels. The continuation of high oxidant levels depended upon the speed of the frontal invasion inland. When the speed was low, high oxidant levels continued longer.

60840 **APTIC NO. 82825**

Takeuchi, Kiyohide and Fujio Kimura

NUMERICAL SIMULATION OF THE AIR POLLUTION IN TOKYO AREA. *(Tokyo fukin no taiki osen no suchi simureishion). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):259, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 145.)*

Simulation calculations of sulfur oxides concentrations in the Tokyo area were made using the MRI-E10 scheme, and the adequacy of this model was evaluated. Assuming that the wind direction and wind velocity at a given altitude are constant in a horizontal direction, observation values obtained by pilot balloon were used. The stationary pollutant sources were classified by effective stack height and distributed as lattice points; diffusion coefficients were determined based on the estimated values by non-lift balloon observation, and the altitude of the mixed layer was measured by lower layer sonde. The isopleths of sulfur dioxide concentration at ground level and variation of ground SO2 concentration with time were obtained. The calculated values were generally in good agreement with observed values; however, the calculated values were higher in the vicinity of large scale pollutant sources. Reasons for such discrepencies are discussed.

60841 **APTIC NO. 80314**

Thiebaux, M. L.

DETERMINATION OF ONE-PARTICLE EFFECTIVE EDDY DIFFUSIVITY TENSOR IN LINEARLY INHOMOGENEOUS TURBULENT FLOWS. *J. Atmospheric Sci., 32(11):2136-2143, Nov. 1975. 5 refs.*

The effective eddy diffusivity tensor is related to Lagrangian position statistics of a point tracer advected by an ensemble of turbulent flows. The flow may be compressible, nonstationary, and spatially inhomogeneous in a restricted sense. The spatial inhomogeneity is such that the cumulants of the Lagrangian position field depend linearly on the coordinates, which may be curvilinear. The effective eddy diffusivities so determined cannot be used to predict the nondivergent part of the cross-gradient turbulent flux of a contaminant. (Author abstract)

60842 **APTIC NO. 76377**

Tillman, Frank A. and E. Stanley Lee

EPISODE CONTROL OF AIR POLLUTION. *J. Environ. Sci., 18(5):21-26, Sept.-Oct. 1975. 14 refs.*

A dynamic decomposition model was built to assist the strategy of optimal pollutant emission distribution. Since the air pollution process is highly nonlinear, nonlinear factors must be considered in the model. This is accomplished by dividing the area into different regions, with updated parameters for each region. The model is optimized by using linear programming. The basic abatement model can be extended to cover different time periods. The concentrations of pollutants are assumed constant within each region and within each time period. (Author abstract modified)

60843 **APTIC NO. 76565**

Tomatsu, T., Y. Kondo, N. Iwagami, and T. Watanabe

EXPERIMENTS ON TRACE ATMOSPHERIC COMPONENTS BY LARGE BALLOON: ATMOSPHERIC OZONE OBSERVATIONS AT NEW MEXICO AND SANRIKU AREA. *(Daikikyu ni yoru biryo taiki seibun jikken: Nyu Mekishiko oyobi Sanriku no okeru taiki ozon kansoku). Text in Japanese. Tokyo Daigaku Uchu Koku Kenkyusho Hokoku (Bull. Inst. Space Aeronaut. Sci., Univ. Tokyo), 11(2):469-476, July 1975.*

Atmospheric observation balloons were sent up at Alamogordo, New Mexico (November 13, 1973), and Sanriku Balloon

Center, Japan (May 30, 1974), to determine atmospheric ozone density distributions in the troposphere and stratosphere. Both areas are located in the middle of the westerlies. The Alamogordo balloon attained level flight at an altitude of 30 km, for about 1 hour 45 minutes, in mid-morning. During this time, variations in ozone density agreed with changes in NO density. The Sanriku balloon entered level flight at an altitude of about 27.5 km, about 70 km out over the Pacific Ocean. It changed direction at that time, and drifted westward falling near Narugo (latitude, about 39 N; longitude, about 140.5 E) 7 hours 30 minutes later. It was recovered in March 1975. With ozone sonde, vertical distributions of atmospheric ozone above 14 km were found to have higher values in descent than in ascent. Below 14 km, ozone values agreed, for ascent and descent. At 21 km, maximal mixing of east and west winds, indicated by slight minimums in the ozone density distributions, occurred at 9 am and 9 pm. In the stratosphere, there was more than a 30% difference in ozone densities over a horizontal distance of 200 km. These phenomena are due to different ozone transport mechanisms. At 21 km, the presence of a thin aerosol layer may also have affected behavior. First-degree scattering approximations were used to calculate ozone overburden above the balloon. Both ozone overburden and observed ozone density for the altitude increased up to 5 pm, then decreased, as the sun went down (sunset on earth, 6:50 pm).

60844 APTIC NO. 80001

Tominaga, K.

ENVIRONMENTAL DESTRUCTION BY CHLOROFLUOROCARBONS. *(Kuroro- furuoro-kabon ni yoru kankyo hakai). Text in Japanese. Kagaku to Kogyo (Tokyo) (Chem. Chem. Ind.), 28(10):739, 1975.*

The effect of chlorofluorocarbons on the stratospheric ozone layer is reviewed. The chlorofluorocarbons such as dichlorodifluoromethane and trichlorofluoromethane are chemically stable and do not absorb radiation with wavelengths longer than 230 nm. The water solubility of the compounds is poor, therefore the chlorofluorocarbon gases diffused out of spray cans remain in a stable condition in the atmosphere. The chlorofluorocarbons undergo photochemical decomposition by absorbing the radiation between 185 to 227 nm, which neither oxygen nor ozone strongly absorbs, and the chlorine atom is produced. The chlorine atom reacts with ozone to produce monochlorine monoxide and oxygen, and the former reacts with atomic oxygen to regenerate atomic chlorine. Therefore the chlorine atom can be considered as the catalyst for the chain reaction of ozone decomposition. The reaction rate of ozone decomposition by chlorine is 1000 times faster than that of chlorine with methane. With the accumulation of chlorofluorocarbons in the atmosphere, the chlorofluorocarbons are expected to diffuse into the stratospheric region. The ozone layer could be damaged by the chlorine atom of the chlorofluorocarbon photochemical reaction product. The 10% destruction of the present stratospheric ozone layer would yield a 20% increase in the intensity of the ultraviolet radiation at the earth's surface, which has the potential to increase the occurrence of human skin cancer.

60845 APTIC NO. 80074

Tominaga, Takeshi

RADIATION AND PHOTOCHEMISTRY OF CHLOROFLUOROCARBONS. *(Kurorofuruorokabon no hoshaen kagaku oyobi kokagaku). Text in Japanese. Kagaku no Ryoiki (Chem. Region), 29(9):661-668, Sept. 1975. 34 refs.*

Photochemical reactions of chlorofluorocarbons are of great importance with respect to the ozone in the stratosphere. Radiochemical studies of chlorofluorocarbons, including the formation mechanism of various chlorofluorocarbons, are reviewed. Studies on photochemical reactions of chlorofluorocarbons are also reviewed. The photodecomposition of chlorofluorocarbons and their reaction with the O3 in the stratosphere are also reviewed. The world annual production of chlorofluorocarbons is about one million ton. It is used mostly as aerosol gas, and therefore most of it is emitted into the atmosphere. Atmospheric concentrations of trichlorofluorocarbons and dichlorodifluorocarbons have been measured since 1970, which indicates a generally increasing trend, with lower concentrations over the Atlantic Ocean and desert areas. The atmospheric residence time of chlorofluorocarbons is estimated to be several tons of years, and several million tons of chlorofluorocarbons have already accumulated in the troposphere. The chlorine atom produced by decomposition of CF2Cl2 and CFCl3 catalyzes the decomposition of O3; a large amount of O3 is decomposed by the chain reaction, and this cannot be overlooked from the standpoint of the environmental balance of O3.

60846 APTIC NO. 84706

Torihashi, Yoshikazu, Motonori Tamaoki, Masanori Yoshioka, Saburomaru Tsujimoto, Yorio Oki, and Tsuneaki Takada

CORRELATION BETWEEN VEHICLE EXHAUSTS AND TRAFFIC DENSITY. *(Jidosha haishutsu gasu to kotsuryo tono sokan). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):550, 1975. (Presented at Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 284.)*

During windy conditions, the correlation between nitrogen oxides, carbon monoxide, and sulfur oxides with the volume of traffic was studied for a busy highway. The traffic averaged 70,000 to 90,000 vehicles/day, of which 15% to 60% were large vehicles. Two locations near an intersection and one location remote from the intersection were sites of investigation. The pollutant concentration was correspondingly lower as the wind velocity was greater. The measured level of each pollutant tended to increase with an increased number of vehicles. The observed level of each pollutant against the number of vehicles distributed itself between two straight lines drawn on the correlation diagram of pollutant and number of vehicles. The fluctuation of nitric oxide of this plot was smaller than that of the nitrogen oxides. The correlation between sulfur oxides and the number of vehicles showed a similar tendency as that of nitrogen oxide and carbon monoxide. Particularly for the sulfur oxides, when the measured levels were subtracted from the SOx background concentration (which was determined at the opposite side of the street to the upwind), there was very little fluctuation.

60847 APTIC NO. 82902

Tsuruda, Haruo and Shinji Wakamatsu

THREE-DIMENSIONAL STRUCTURE FOR LAND AND SEA BREEZES, AND AIR POLLUTION. *(Kairikufu no rittai kozo to taiki osen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):439, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 181.)*

Widespread air pollution in Kawasaki, Tsurumi, and the Negishi coastal industrial region was studied with a pilot balloon, low- layer sonde, and helicopter during January 20-25, 1975. A warm, high pressure layer existed, with a thickness of about 500 m, with wind speed peaks up to 10 m/sec at an altitude of about 400 m. Its lower layer had low wind velocities, because of a strong inversion near the ground. When the inversion disappeared because of the effects of insolation, sea breezes from Tokyo Bay began to blow. The thicknesses of the wind layer (150 m, 300 m) were much lower than in the summer. At ground level, the front line of the sea breezes proceeded at nonuniform speeds. At the beginning, wind velocities are less than 1 m/sec. The speed of advance of the front line of the sea breezes was 1-2 m/sec slower than the wind velocities of the sea breezes.

60848 **APTIC NO. 83840**

Uchida, Eiji, Eizo Maruyama, Seiichi Suginaka, Shinetsu Konno, Kazuya Tamura, and Takashi Adachi

A STUDY ON THE ATMOSPHERIC ENVIRONMENT OF THE SAPPORODTOMAKOMAI REGION. PART 2. CONCENTRATION OF POLLUTANTS AND METEOROLOGICAL CHARACTERISTICS IN SAPPORO CITY. *(Sapporo-Tomakomaichiku no taiki kankyochosa ni kansuru kenkyu. 2. Sapporo ni okeru taikiosennodo to kisho tokusei). Text in Japanese. Kishocho Kenkyu Jiho (Journal of Meteorlogical Research) (Tokyo), 27(9-10):319-328, Sept.-Oct. 1975. 3 refs.*

Relationships between diurnal variation of primary pollutant concentration and meteorological conditions were analyzed using data of sulfur oxides and suspended particulate concentrations of relatively high concentration days selected from 1973 data obtained in Sapporo city. Concentration variations due to other factors such as pollutant source distribution and emission quantity were regarded as pollutant source distribution and emission quantity were regarded as background, and the effects of convergence in the surface boundary layer and temperature stratification on pollutant concentration variation were analyzed. The presence of a convergence field contributed to the increase in air pollution potential. With the short-period perturbations filtered out, variations in convergence and divergence showed a good correspondence to pollutant concentration deviation particularly in the western region of Sapporo city. Such a convergence in the western region tended to be prominent at northeast and southeast wind directions. The pollution potential was also increased by subsidence inversion in the surface boundary layer, which tended to occur when the area concerned was located behind a traveling high pressure with its center in Honshu.

60849 **APTIC NO. 76441**

Ukeguchi, N., H. Okamoto, and R. Ohba

THE NUMERICAL ANALYSIS OF THE DIFFUSION AROUND STRUCTURES. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 330-348. 3 refs. (Feb. 17-21.)*

A model involving the numerical analysis of gas diffusion around rectangular structures is described. The Marker and Cell finite difference method is used to first calculate the wind velocity profile around the structure. A finite difference method and the Monte Carlo method are then applied to obtain concentration calculations. The simulation model is applicable to the analysis of diffusion around many kinds of two dimensional rectangular structures formed of vertical and horizontal lines. Examples are illustrated in which the model is applied to the diffusion of stack gas around a rectangular building and to exhaust emissions from automobiles along roads of the semi-subway or canal type.

60850 **APTIC NO. 76535**

Van Valin, C. C., R. F. Pueschel, and F. P. Parungo

FORMATION OF CLOUD AND ICE NUCLEI BY THE COMBUSTION OF CRUDE OIL. *J. Appl. Meteorol., 14(6):1200-1203, Sept. 1975. 11 refs.*

The formation of cloud and ice nuclei by the combustion of crude oil is discussed. Concentrations of Aitken nuclei and ice nuclei found in smoke plumes from an oil well fire are elevated by at least an order of magnitude as compared with the surrounding atmosphere. The particles remain airborne for considerable distances downwind. The composition of most particles in the plume is suggestive of the clay minerals. The relative high concentrations of sulfur, chlorine, and phosphorus suggest the presence of other substances that are inactive as ice nuclei, but which may be effective as cloud condensation nuclei. (Author abstract modified)

60851 **APTIC NO. 83389**

Viala, A., J. P. Cano, J. P. Massari, and E. Schreiber

STUDY OF THE VERTICAL DISTRIBUTION OF NITROGEN OXIDES IN THE ATMOSPHERE NEAR A MAJOR THOROUGHFARE IN THE MARSEILLES AGGLOMERATION. *(Etude de l evolution verticale de la pollution oxyazotee atmospherique pres d une grande arter d l agglomeration marseillaise). Text in French. Pollut. Atmos. (Paris), 17(67):201-204, July-Sept. 1975. 5 refs.*

There are notable differences in the distribution of nitrogen oxides in the air. Their evolution is more significant between ground level and 6th story level than above the 6th story. The production of nitrogen dioxide increases during warm weather. However, although nitrogen dioxide formation rates increase and decrease parallel to those of nitric oxide, they do not fluctuate so much, especially at the 6th and 10th stories. An increased wind factor diminishes nitrogen oxide pollution although pollution by nitric oxide is greater than by nitrogen dioxide. Temperature and sunlight favor oxidation of nitric oxide to nitrogen dioxide.

60852 **APTIC NO. 83871**

Wakamatsu, Nobutsuka

VERTICAL DISTRIBUTION OF OZONE IN THE PLANETARY BOUNDARY LAYER. *(Sechi kyokaiso naibu deno ozon no enchoku bunpu). Text in Japanese. Tenki (Weather), 22(9):38-44, 1975. 8 refs.*

The Environmental Center of Kanagawa Prefecture has observed the vertical distribution of ozone in the planetary boundary layer using a helicopter and pilot balloons during the years 1972 to 1973. The helicopter, loaded with an ozonometer and a thermometer, flew twice a day for 1.5 hr to investigate the vertical distribution of ozone up to one kilometer. The wind was observed by pilot balloons at four observation points using the point observation method at an ascending speed of 200 m/min. The high concentration of oxidant on the surface corresponds to the high concentration of ozone in the upper air, and the vertical distribution of ozone is closely related to the distribution of atmospheric temperature and wind caused by regression of sea breezes. It is frequently observed that once the sea breeze blows inland, the oxidant concentration on the surface and in the upper air starts to increase. If the above takes place, the area with a high concentration of ozone corresponds to the upper extremity of the sea breeze, and the altitude at which the maximum concentration of ozone is generated concurs with the wind focus, 500-700 m. This layer is below the upper extremity of the sea breeze and is above the bottom of the inversion layer of atmospheric temperature.

60853 **APTIC NO. 80073**

Wakamatsu, S.

CUMULATIVE FREQUENCY DISTRIBUTION OF SULFUR OXIDES AND ITS TREATMENT. *(Iou sankabutsu nodo no ruiseki dosu bunpu to sono toriatsukai). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(2):67-72, 1975. 2 refs.*

The establishment of a quantitative evaluation method for sulfur oxides concentrations is essential for efficient air pollution control. In addition to information concerning mean value, dispersion, maximum value, the frequency of high concentrations and hourly, seasonal, and yearly variations, the pollution distribution pattern is important for pollutant concentration evaluation. The numerical formulation of distribution patterns for sulfur oxides concentrations was attempted. The cumulative frequency distribution of SOx is usually treated as a log-normal distribution; however, this assumption is unsatisfactory in many cases. If the cumulative frequency distribution of C (concentration) is obtained, then C prime (constant) can be obtained by the least mean square method. Therefore, if the arithmetic mean value of a measured concentration is known, the normalized C + C prime distribution can be described. By this method, an arbitrary percentile value of C can be obtained, and simultaneously the pollution characteristics can be evaluated quantitatively.

60854 APTIC NO. 83833

Wakamatsu, S.

AN OBSERVATIONAL SURVEY ON HORIZONTAL OZONE DISTRIBUTION. *(Ozon nodo no heimenbunpu to kiryu no kasoku). Text in Japanese. Tenki (Weather), 22(8):60-65, Aug. 1975. 13 refs.*

In order to estimate the relation between the plane distribution of ozone concentration and the wind direction, the concentration of ozone in a plane at an altitude of 300 m and atmospheric temperature was surveyed using a helicopter. Air current was observed to estimate the partial ascending and descending currents, which greatly effect the occurrence of high concentrations of ozone on the surface, using a non-lift 160gr synthetic resin film balloon. The airborne ozone was analyzed by an ozone monitor using the chemiluminescent method, and the surface ozone was analyzed by a colorimeter using the neutral potassium iodide method. The concentration of ozone on the surface is closely related to the ingression of the sea wind blowing inland; the formation and the movement of the local lines of discontinuity greatly contribute to the generation and duration of high ozone concentrations; and the concentration of ozone in higher planes closely corresponds to that on the surface and to the high temperature.

60855 APTIC NO. 76223

Wallington, C. E.

CALCULATION OF ATMOSPHERIC DISPERSION. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975. p. 381-402. 20 refs. (Feb. 17-21.)*

Mathematical models for calculating the atmospheric dispersion of airborne pollutants are reviewed. A wind fluctuation and processing technique is useful for making relatively direct assessments of dispersion or constructing climatological records of turbulence. This method is independent of assumptions of concentration distributions or transfer processes and can be tailored to particular periods or ranges of dispersion. The numerical solution of diffusion equations enables proper account to be taken of the vertical variations of wind and diffusion parameters and can include a wide range of ancillary features such as changes in wind and diffusion coefficients with time as well as falling particles. This method also accounts for horizontal dispersion by wind shear and vertical diffusion. Wind profile approaches to diffusion are more relevant to research on air/ground and air/sea transfer problems than to dispersion, except for very short ranges. Although models do not yet include comprehensive mesoscale meteorological features, diffusion category methods are probably adequate for many practical purposes. (Author summary modified)

60856 APTIC NO. 79902

Wangen, Lawrence E. and Donald M. Rote

DISCUSSION OF APPLICATIONS MODEL. *Preprint, Argonne National Lab., Argonne, Ill., Energy and Environmental Systems Div., 19p., 1975.*

A simplified version of a long term climatological air quality model (LTM) was developed to decrease execution time. The model estimates ground level concentrations of various pollutants on and around air bases for air quality impact studies. To reduce the large number of line sources, a single flight path was established for each runway dependent on the aircraft types actually using the runway. The resulting time savings is estimated to be about a factor of four. The number of wind speed classes and the number of stability classes were both reduced from six to two. Because of lack of agreement with the original model, the number of stability classes was changed to three. Use of two wind speed classes and three stability classes reduces the time by a factor of 3.3 beyond the reduction due to the decrease in line sources. The best method of combination of stabilities is still an open question.

60857 APTIC NO. 80223

Wangen, Lawrence E. and Donald M. Rote

THE EFFECTS OF TEMPORAL VARIATIONS IN EMISSIONS AND METEOROLOGY ON ANNUAL AVERAGE CONCENTRATION CALCULATIONS USING A CLIMATOLOGICAL DISPERSION MODEL. *Preprint, Argonne National Lab., Chicago, Ill., 39p., 1975. 11 refs.*

The concentrations resulting from calculating long term average concentrations with Gaussian plume dispersion models using 24-hour average emissions and meteorology are investigated and compared with concentrations calculated using time resolved emissions and meteorology. The errors resulting from using average data are investigated using sulfur dioxide from Chicago area power plants (elevated point sources) and carbon monoxide from Chicago area vehicle traffic (ground based area sources) together with multiyear historical records of climatology by month and time of day from Midway Airport in Chicago. Calculated annual average SO2 concentrations, due to power plant emissions, indicate a relatively small overprediction of about 6% when no account is taken of diurnal or seasonal variations in emissions and meteorological parameters when compared to the calculation using time resolved emissions and climatology. However, the analogous error for ground based CO due to vehicular sources is 24%. When there is a strong diurnal emission pattern but no, or weak, monthly emission pattern, it is possible to eliminate most of the error by using annual average diurnal climatology. Annual averages could be taken from composites of monthly 24-hour averages for a situation with no diurnal but strong monthly or seasonal emissions variations. (Author abstract modified)

60858 APTIC NO. 76059

Weber, A. H., J. S. Irwin, J. P. Kahler, and W. B. Petersen

ATMOSPHERIC TURBULENCE PROPERTIES IN THE LOWEST 300 METERS (FINAL REPORT). *North Carolina State Univ., Raleigh, Environmental Protection Agency Grant 800662, Program Element 1AA009, ROAP 21ADO-33, Rept. EPA-600/4-75-004, 162p., July 1975. 47 refs.*

NTIS: PB 246215/AS

Atmospheric turbulence parameters both within and above the surface layer that are relevant to the dispersion of air pollutants were studied. The data were collected at a meteorological facility at Beach Island, South Carolina. The approximate relationships involving standard deviations of the vertical and lateral wind components and mean vector wind speed were investigated and found to be very accurate in almost all circumstances. The ratio of vertical wind component to the surface friction velocity was calculated and agreed with previous measurements. Wind elevation was a function of the scaling parameter involving the ratio of the Coriolis parameter (in near neutral stability conditions) to the surface friction velocity. The spectral scale and mixing length were found to be consistent with the results of Pasquill. Properties of spectra measured at 18.3 m agreed well with previously published results. (Author abstract modified)

60859 APTIC NO. 76614

Wigley, T. M. L.

A NUMERICAL ANALYSIS OF THE EFFECT OF CONDENSATION ON PLUME RISE. *J. Appl. Meteorol., 14(6):1105-1109, Sept. 1975. 13 refs.*

The results of a numerical solution of the equations of moist plume rise are presented. The trajectories of wet and dry cooling tower and scrubbed industrial plumes are compared under a wide range of atmospheric stability conditions. The results of previous similar comparisons are discussed. They are all qualitatively correct, but there are important quantitative differences between them and the numerical solution. Previous approximate analytic results have shown that the critical lapse rate for the transition to unstable plume behavior for wet plumes is close to the saturated adiabatic lapse rate. The numerical solution confirms this result when one allows for the variation of the saturated adiabatic lapse rate with height. The approximate analytic formula for the maximum height of rise of dry plumes is also examined and found to overestimate plume rise by 6 to 20% when compared with the numerical solution. (Author abstract)

60860 **APTIC NO. 84432**

William, W. J., J. J. Kosters, A. Goldman, and D. G. Murcray

SIMULTANEOUS STRATOSPHERIC MEASUREMENTS OF FLUOROCARBONS AND ODD NITROGEN COMPOUNDS. *Preprint, American Geophysical Union, 11p., 1975. (Presented at the American Geophysical Union Annual Meeting, Dec. 1975.)*

Simultaneous stratospheric measurements of fluorocarbons and odd nitrogen compounds were made during sunset in the 10.5 to 13.0 micron region. The absorptions due to CH2Cl2, CFCl3, and nitric acid are evident in the spectra obtained at the larger zenith angles. An additional absorption feature, on which the carbon dioxide, ozone, and water lines are superimposed, around 795/cm tentatively assigned to carbon tetrachloride is evident. The roughly periodic noise evident on the first few records is not electronic noise but is the result of optical interference effects. The major atmospheric absorbers in this spectral region are CO2, water, and O3.

60861 **APTIC NO. 79246**

Wilson, J. V.

ORFAD, A COMPUTER PROGRAM TO ESTIMATE FOG AND DRIFT FROM WET COOLING TOWERS. *Oak Ridge National Lab., Oak Ridge, Tenn., Reactor Div., Atomic Energy Commission Contract W-7405-eng-26, 31p., Jan. 1975. 10 refs.*

NTIS: ORNL-TM-4568

A computerized model for estimating the number of hours when fog and ice occur as a result of wet cooling tower operation and the amount of dissolved solids deposited at different directions and distances from such towers is described. The computer program uses hourly weather data from tapes to calculate appropriate values of plume rise and dispersion. The vapor density where the plume reaches the ground is then calculated and is used to further calculate particle deposition rates and fogging. The output consists of four tables providing data on fog, ice, drift, and salt concentration.

60862 **APTIC NO. 79830**

Wood, John L., W. Terry Echols, Rolland C. Schroeder, and Richard A. Porter

POTENTIAL FOR DESIGNATING SELECTIVE EMISSION STANDARDS FOR AIR POLLUTION CONTROL BASED ON AN ANALYSIS OF CLIMATOLOGICAL REGIONS IN TEXAS. *Texas Air Control Board, Meteorology Section, Rept. E/S 4, 112p., Jan. 1975. 17 refs.*

Climatological data files were examined with different analysis techniques and compared with results of parametric diffusion modeling. Climatological data included surface wind speeds, frequency of occurrence of stability classes, and seasonal wind speeds in the mixing layer. The joint results of these studies were used to select regions and seasons of the year when air pollution emission standards could be relaxed without danger of approaching the ambient air standards. General seasonal relaxation of emission standards appears justifiable in areas where both analyses are favorable: the Texas Panhandle in winter, the eastern Panhandle in spring, the southeastern Panhandle and south Texas in summer, and the eastern two thirds of the Panhandle in fall. Where the probability of short term excursions to endanger the National Ambient Air Quality Standards seems highest, yet where modeling indicates that over the long term, excursions are less likely, relaxation of emission standards is only recommended when combined with supplementary control systems. These areas include west and southwest Texas in winter; extreme west Texas in spring; and west Texas, southeast Texas, and east Texas in summer and fall. Possible relaxation is recommended only after modeling of all sources in the area, in areas where long term violations appear probable. These areas include south central Texas in winter, the area between Abilene and Wichita Falls in spring, east central Texas in summer, and central Texas in fall. (Author abstract modified)

60863 **APTIC NO. 81979**

Woodrow, J. E., J. N. Seiber, D. G. Crosby, K. W. Moilanen, C. Mourer, C. J. Soderquist, and W. L. Winterlin

THE ENVIRONMENTAL FATE OF PARATHION IN A TREATED ORCHARD. *Preprint, American Chemical Society, Washington, D. C., 27p., 1975. 24 refs. (Presented at the American Chemical Society, National Meeting, 170th, Chicago, Ill., Aug. 29, 1975.)*

Results are reported from a study of an ethyl parathion (0,0-diethyl 0-p-nitrophenyl phosphorothioate (PS)) treated plum orchard. Paraoxon (0,0-diethyl 0-p-nitrophenyl phosphate (PO)) and p-nitrophenol (PNP) residues were determined at some air sampling sites along with PS to allow correlation with soil and leaf residues and to ascertain whether conversion to these products occurred in the air. Analysis of air samples showed significant levels of PO during a 21 day sampling study. The fact that orchard air PO:PS ratios were greater than those on leaves and in soil early in the study and that the downwind air ratios were always greater suggest that a major source of airborne PO is from conversion of airborne PS. A comparison of airborne PNP levels in the orchard environment with those in samples taken from a site 25 mi away implies that PNP is an environmentally stable airborne residue. Conversion of PS to PO probably takes place on the surface of airborne particulates and is probably accelerated by sunlight activation. (Author abstract modified)

60864 **APTIC NO. 82600**

Wright, Richard F. and Christian Lysholm

REGIONAL SURVEY OF LAKES IN SOUTHERN NORWAY, FALL 1974. PRELIMINARY ANALYSIS OF WATER-CHEMISTRY DATA. *Rept. IR 6/75, 24p., Feb. 1975. 19 refs.*

A survey of 155 lakes in Norway (south of 63 deg North latitude) revealed that acidic precipitation is severely affecting large areas of southernmost Norway and to a lesser degree areas in western Norway. Scattered areas in southeastern Norway are also being affected. Sulfuric acid is the major pollutant, and polluted precipitation appears to account for increased sulfate concentrations in the lakes of southern Norway amounting to 2-6 ppm. Only 1-2 ppm SO4 is coastal lakes is of seawater origin. The additional source of SO4 appears to be the emission of air pollutants in highly industrialized areas of Great Britain and central Europe. These emissions are transported over long distances to Scandinavia and are washed out as polluted precipitation. (Author summary modified)

60865 **APTIC NO. 84671**

Yamada, Hirotoshi, Tatsuo Maeda, Tetsuo Fukuda, and Takayuki Hirosue

DATA ANALYSIS ON PHOTOCHEMICAL OXIDANTS IN HOHHU CITY, RELATIONSHIP BETWEEN OXIDANTS AND NOX. *(Hohhushini okeru kokagaku okishidanto no kaiseki kekka. Ox to NOx tono kankei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):618, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 350.)*

The oxidant level in relation to nitrogen dioxide and wind factors was studied in Hohhu City. The hours for the occurrence of peak oxidant levels and NO2 levels were almost the same.

The day s peak oxidant level occurred 4 to 5 hr after the peak NO2 level. The NO2 level and the oxidant level were relative to each other. When the NO2 level was more than 0.02 ppm, an oxidant level greater than 0.1 ppm usually occurred. An oxidant level greater than 0.1 ppm tended to occur when the atmospheric temperature was higher than 30 C and with a southerly wind with a velocity of less than 4 m/sec. The ESE wind usually produced an oxidant level greater than 0.15 ppm, at which time an oxidant warning was issued. Thus with meteorological forecasts and early morning hour measurements of the NO2 level, a reliable forecast of the oxidant level would be impossible.

60866 **APTIC NO. 76577**

Yamagata, Hideo

ON OXIDANT AND NITROGEN OXIDES IN OITA CITY. PART 3. *(Oita-shi no okishidanto to chisso sankabutsu ni tsuite dai 3-ho). Text in Japanese. Fukuoka Kanku Kisho Kenkyukai-shi (Proc. Fukuoka District Meet. Study Meteorol., no. 36:142, Sept. 1975.*

Oxidant levels at Oita city in 1974 are considered in relation to meteorological factors and nitrogen oxides levels. Stability in the lower atmosphere was calculated from wind velocities and temperature. The average stability value obtained for the 53 cases in which an oxidant level more than 0.1 ppm was observed was -1.6, indicating unstable atmospheric conditions. The places showing high oxidant levels tended to have the surface winds. No correlation between the oxidant level and nitric oxide level could be observed, due to the low NO level which did not allow determination of its concentration variation.

60867 **APTIC NO. 82629**

Yates, Harold W.

LIMITATIONS AND PROSPECTS FOR ATMOSPHERIC SOUNDING. *Proc. Soc. Photo-Opt. Instrum. Eng., vol. 51:1-14, 1975. 8 refs.*

Limitations and prospects for the remote sensing of atmospheric (lower, middle, and upper) temperature are reviewed based on satellite experiments. Atmospheric temperature is deducted from observations of thermal radiation emitted by a gas in the spectral vicinity of one or more of its absorption bands. The amount of energy observed emerging from the top of the atmosphere at a particular spectral position is given by a radiation exchange equation. Fundamental physical limitations to this sounding technique are: vertical resolution is determined by the weighting functions and possesses a fundamental as well as a practical limit; the mathematical process of calculating temperatures from radiances is approximate and cannot provide an exact solution; and the real atmosphere possesses variations in aerosol, cloud, and gas mixture which enhance the effects of first two limitations. Instrumental limitations involve radiometer noise levels and the accuracy of spectroscopic measurements. Satellite sounding produces an output which is presently operationally useful and is expected to improve significantly in the near future, with accuracy and resolution being close to the natural limits of the method.

60868 **APTIC NO. 76440**

Yordanov, D.

RELEVANT METEOROLOGICAL PARAMETERS FOR PREDICTIONS OF THE AIR POLLUTION IN THE PLANETARY BOUNDARY LAYER. *The Clean Air Society of Australia and New Zealand, Clean Air Conf. 1975 Proc., Rotorua, New Zealand, 1975, p. 320-329. 9 refs. (Feb. 17-21.)*

Meteorological parameters for predicting air pollution in the planetary boundary layer are discussed. Assuming stationary conditions and a horizontal homogeneity of the underlying surface, the turbulent state in the planetary boundary layer (height of about 1 km) is completely specified by the Rossby number, the external parameter for thermal stratification, and two external parameters for the baroclinicity. The turbulent state of the planetary boundary layer under the same conditions is also determined by the internal parameter for the thermal stratification and two internal parameters for the baroclinicity. Parameters external to the boundary layer which may be obtained from synoptic data possess a definite advantage for the statistical processing of air pollution data and forecasting, while parameters internal to the boundary layer are useful for theoretical studies of air pollution. The dependence between the parameters internal and external to the boundary layer which is given by the resistance law is necessary for theoretical predictions of air pollution. (Author abstract modified)

60869 **APTIC NO. 80045**

Yoshida, Hiromi, Masayoshi Okamoto, Shigeyoshi Kojima; Takeo Hashimoto, Takahiro Ohse, Keiko Tsubura, Toru Fujii, and Kiyoshi Imamura

STUDIES ON AIR POLLUTION POTENTIAL OVER PLAIN AREA BY USING THE ACCUMULATION CURVE OF AIR TEMPERATURE DIFFERENCE AS AN INDEX OF THE ATMOSPHERIC STABILITY. *(Taiki anteido no shihyo to shiteno ondosa o mochiita koiki taiki osen no kaiseki ni kansuru kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(2):51-57, 1975. 5 refs.*

A simple semiquantitative method which expresses the periodical variation of stability was developed and applied to the Osaka area to study air pollution potential. There are 20 stations in the air monitoring network of Osaka Prefecture. The hourly differences of air temperature between each station and the top of Mt. Ikoma were accumulated in time series. These accumulated values were used to obtain the accumulation curves of air temperature difference (TDA curve). The time scale was taken from 9:00 pm to 9:00 am. These TDA curves were classified into several typical patterns, and the relationship between the type of pattern of TDA curve and observed hourly average sulfur dioxide concentrations was analyzed. The patterns of TDA curves, based upon meteorological factors, also represent local characteristics around each monitoring station. A high SO2 episode was successfully predicted using the TDA curve patterns. (Author abstract)

60870 **APTIC NO. 83508**

Yoshida, Tsuyoshi

EFFECTS OF ROUGHNESS ON DIFFUSION IN A WIND TUNNEL EXPERIMENT. *(Fudo jikken ni yoru chihyo sodo no kemuri no kakusan ni oyobosu eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):272, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 156.)*

Characteristics of diffusion phenomena determined in a wind tunnel were investigated. Using a 107 by 214 by 1000 cm wind tunnel with 12.5 cm fence and 5 cm and 2 cm blocks placed in zigzag arrangement to produce roughness, the wind speed profiles, turbulent intensity profiles, lateral plume spread, vertical plume spread, and turbulent diffusion coefficient were obtained. The vertical and lateral plume spreads derived by using roughness models were compared to those derivved without roughness models. The former corresponded to B rank in Pasquill s chart and the latter corresponded to E-F rank. This result indicates that simulation in wind tunnels with less turbulence does not necessarily simulate the neutral condition in the atmosphere with only the concentration correction with respect to the observation time.

60871 **APTIC NO. 84684**

Yoshikado, Hiroshi, Minoru Gamo, and Osayuki Yokoyama

AN OBSERVATION OF THE SEA BREEZE AT KASHIMA AREA. *(Kashima-nada kara no kaifu no koiki kansoku). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 10(5):23-51, Sept. 1975. 4 refs.*

The sea breeze at Kashima is one of the most important local wind systems in the Kanto Plain. The sea breeze was observed in a special observation project from August 20 through August 24, 1974 in Kashima. The vertical wind profiles were measured by single theodolite pi-bal traces at 6 points from the shore to 40 km inland. The temperature distribution up to a height of 1500 m was measured from a airplane. The depth of the sea breeze was about 1000 m at every observation point. The characteristic feature of the temperature profiles were a near-neutral mixing layer over land and an increasing temperature with time up to 1500 m over sea. The latter heating is mainly due to an adiabatic subsidence in the sea breeze circulation system.

60872 APTIC NO. 80921

Yoshikawa, Tomoaki and Kozo Shintani

SUMMARY OF THE FACT-FINDING SURVEY OF THE PHOTOCHEMICAL AIR POLLUTION. *(Kokagaku taiki osen no jittai chosa no aramashi). Text in Japanese. Kankyo Hoken Reporto (Environ. Health Rept.), no. 35:3-15, Sept. 1975. 9 refs.*

A fact-finding survey of photochemical air pollution was conducted in the Tokyo Bay and Osaka Bay areas during 1972-1974 by the Air Protection Section of the Envrionmental Protection Agency of Japan. The results of the survey of 1973, when photochemical air pollution was especially prominent, sevice to introduce the investigation and its achievements. The actual condition of photochemical air pollution was investigated using the following data: the area distribution of oxidant generation in Tokyo Bay and Osaka Bay, the altitude distribution of the concentration of pollutants, and the extensive area distribution of the concentration of air pollutants measured from an airplane. Other surveys conducted included: an on-site survey of photochemical reactions using a mobile smog chamber, a meteorological survey for altitude distribution of wind and temperature, and an extensive area diffusion test from Tokyo Tower. The results of the survey will be used for development of a photochemical air pollution forecasting system in 1975.

60873 APTIC NO. 84710

Yoshioka, Masanori, Yoshikazu Torihashi, Motomori Tamaoki, Saburomaru Tsujimoto, Norio Oki, and Tsunetaka Takada

DISTRIBUTION OF HYDROCARBONS AT HIGHER OXIDANT CONCENTRATION. *(Okishidanto konodo doki ni okeru tankasuiso no bunpu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):627, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 360.)*

The change in the levels of atmospheric hydrocarbons during periods of high oxidant levels was considered. The atmospheric carbon monoxide (CO) level was used as the standard. The hydrocarbons were trapped with liquid oxygen and analyzed by gas chromatography, while CO was analyzed by a non-methane hydrocarbon analyzer using a methane reduction method. A high correlation between CO and hydrocarbon levels was found to exist during periods with low oxidant levels, less than 99 ppb. However, when the oxidant level was more than 100 ppb, the correlation was much weaker. This poor correlation during periods of high oxidant levels was readily apparent in the cases of ethylene and toluene. Correlations between carbon monoxide and ethane, pentane, hexane, and benzene were not greatly affected by oxidant levels.

60874 APTIC NO. 82476

Youngson, R. M.

ACTINIC RAYS AND AEROSOL SPRAYS. *Brit. J. Ophthal., 59(12):730, 1975. 2 refs.*

The effect of chlorofluoromethane gases released into the atmosphere, mainly from aerosol sprays, on the ozone layer is discussed. The gases, trichlorofluoromethane (CFCl3) and dichlorofluoromethane (CF2Cl2) which are currently produced worldwide at the rate of 1 million ton/yr, give rise to free atomic chlorine radicals which act catalytically on the O3. Each free radical removes thousands of O3 molecules before being removed itself. The chemically inert chlorofluoromethane gases are unaffected by ultraviolet light until they diffuse upwards to a height of 30-50 km. This is a slow process and the maximum effect occurs after a decade. The tropospheric reservoir of gases continues to pass these molecules into the stratosphere. The half-life of CF2Cl2 removal is 80 yr. Current estimates are of an O3 depletion of 5% within 10 yr from now, giving rise to a sufficient increase in biologically damaging ultraviolet light as to cause 40,000 additional cases of skin cancer/yr in the United States.

60875 APTIC NO. 82927

Yutani, Satoshi

DATA ANALYSIS ON THE FACTORS RELATING TO THE REGIONAL DISTRIBUTION OF OXIDANTS IN OSAKA-KOBE AREA. *(Hanshin chiiki ni okeru okishidanto no chiikibunpu to koreni kanrensuru shoyoin no kaiseki). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):299, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 183.)*

Based on data obtained from April-Sept. 1973, relationships between oxidant distribution and geographical and meteorological factors were investigated. An area with an average altitude of less than 200 m, in which about 20% of the area was 100-200 m and the rest was less than 100 m, was the object of analysis. The correlation coefficient matrix of wind velocity with oxidant distribution was obtained by the primary component analysis method and VARI-MAX method. Results of primary component analysis indicated that the contribution rates were 71% for the primary component, 12% for the secondary component, and 5% for the tertiary component. The factor loads of wind velocity concerning primary component and secondary component were obtained by the VARI-MAX method. The factor load distribution diagram (wind velocity distribution) and oxidant distribution diagram measured in the same time period are given.

60876 APTIC NO. 76346

Ministry of International Trade and Industry, Kagoshima Prefecture (Japan)

COMPREHENSIVE ADVANCE SURVEY REPORT ON INDUSTRIAL POLLUTION IN SHIBUSHI REGION (ATMOSPHERIC), OCTOBER 1974. *(Shibushi chiku sangyo kogai sogo jizen chosa hokokusho (taiki kankei), Showa 49-nen, 10-gatsu). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 11(8):745-767, 1975.*

Some basic data on industrial pollution in the Shibushi region, Kagoshima Prefecture, were collected by air tracer experiments, wind tunnel experiments, diffusion simulation calculations, and meteorological condition surveys, to determine the feasibility of industrial development. Shibushi is a coastal area, on the east side of a peninsula, with a bay open to the Pacific Ocean. On the west side of the peninsula is Kagoshima Bay. Wind direction changes from northwest (winter) to southwest (summer). Easterly sea breezes are also present in spring and summer. The industrial complex was assumed to include petroleum refining (1 million BPSD), petrochemicals (800,000 tons/yr, converted to ethylene), and food processing. Petroleum refining and petrochemicals cover an area of 10.2 million sq m. Food processing covers an area of 1 million sq m. Eight stacks, 200 m high, help disperse flue gases (11.05 million N cu m/hr). Total SO2 emissions amount to 2199 N cu m/hr. To simulate diffusion patterns, air tracer experiments with sulfur hexafluoride were conducted on September 29-30, 1971. Wind tunnel experiments with ethylene were also conducted. Results of calculations showed that pollution forecasts based on the above data fell within environmental standards. Calculated hourly values of maximum total combined pollutant concentrations at ground level, measured from the center of the industrial complex, were 0.067 ppm at 4 km and 0.018 ppm at 15.8 km.

60877 **APTIC NO. 76544**

FLUOROCARBONS AND THE OZONE SHIELD. *Lancet, p 647-648, Oct. 4, 1975. 12 refs.*

Studies on the dangers to the ozone shield by fluorocarbon propellants are summarized. Fluorocarbons are disassociated by ultraviolet light, releasing chlorine atoms which cause O3 molecules to break down into oxygen. The O3 layer provides a protective shield against the ultraviolet radiation that causes skin cancer and growth retardation in crops. The bulk of the fluorocarbons remain in the atmosphere 40-150 years before reaching the stratosphere. The quantity of these compounds already released to the atmosphere could deplete the O3 layer by 7-18%. If no more fluorocarbons are released, O3 depletion will still double within 5-10 years, and the tropospheric reservoir will continue to diffuse fluorocarbon molecules into the stratosphere for 100 years. The danger may be overestimated. Naturally occurring halocarbons, such as methyl chloride, are a far more important source. Methyl chloride may actually prevent the build up of an excessively thick O3 layer which is as undesirable as too thin a layer.

60878 **APTIC NO. 79252**

Council on Environmental Quality, Washington, D. C. and Federal Council for Science and Technology, Washington, D. C., Interagency Task Force on Inadvertent Modification of the Stratosphere

TRANSCRIPT OF PROCEEDINGS, INTERAGENCY TASK FORCE ON INADVERTENT MODIFICATION OF THE STRATOSPHERE. *Rept. IMOS 22775, 221p., Feb. 27, 1975.*

NTIS: PB 240 122

The Task Force committee meeting transcript concerns effects of some fluorocarbons and other inert gaseous compounds used as the chief propellant in aerosol products and as coolants and foaming agents. Mathematical models used to predict the extent of ozone reduction resulting from escape of these compounds into the stratosphere are among the topics discussed.

60879 **APTIC NO. 79829**

Federal Council for Science and Technology, Council on Environmental Quality

FLUOROCARBONS AND THE ENVIRONMENT. *109p., June 1975. 142 refs.*

GPO

The fluorocarbon-ozone question was studied. Stratospheric effects are discussed, including ozone reduction by stratospheric chlorine, sources of stratospheric chlorine, modeling, possible climatic effects resulting from large decreases of stratospheric ozone, and research. Estimates for each percent reduction in average ozone concentration range from 2100 to 15,000 new cases of nonmelanoma skin cancer per yr in the U. S. This clinical and epidemiological evidence is supported by the induction of skin cancers in animals exposed to increased ultraviolet radiation. There is some evidence to support a correlation between UV-B and melanoma. Because of the sensitivity of other organisms to UV-B, an increase in the cumulative dosage might be of biological and agricultural significance. An overview is presented of the history, production, and uses of fluorocarbons, the extent of leakage to the atmosphere, and the possibilities for developing or expanding the use of substitute products. There now exists no single Federal agency that can regulate all production or uses of fluorocarbons. Timetables and labelling are briefly discussed. Fluorocarbons released to the environment are a legitimate cause for concern. Unless new scientific evidence is found, fluorocarbons 11 and 12 should be restricted to replacement of fluids in existing cooling equipment and uses not involving release to the atmosphere.

60880 **APTIC NO. 80352**

Fukuoka Dist. Meteorological Observatory, Meteorological Center for Air Pollution

FUNDAMENTAL SURVEY ON THE METEOROLOGICAL FORECASTING IN FUKUOKA PREFECTURE. *(Fukuoka-ken ni okeru taiki osen kisho yoho ni kansuru kiso chosa). Text in Japanese. Fukuoka Kanku Kisho Kenkyukai-shi (Proc. Fukuoka Dist. Meet. Study Meteorol., no. 36:175-179, Sept. 1975.*

Relationships between sulfur dioxide or oxidant concentrations and meteorological factors were analyzed using SO2 and oxidant concentrations measured from 1972 to 1974 in Kitakyushu and Ohmuda. The maximum SO2 and oxidant concentrations were used. For quantitative forecasting, a double regression equation was used, with TEIS data supplied by the Central Observatory (including temperature correction). Quantitative forecasting equations for the day of the measurements and the following day were determined. The reliability of the forecasting equations was evaluated in terms of multiple correlation, standard deviation, and accuracy (79.5-95.0% for the day of the measurements and 80.2-87.1% for the following day).

60881 **APTIC NO. 82965**

Chiba Prefectural Environmental Pollution Research Inst.

INVESTIGATION REPORTS ON AIR POLLUTION (OXIDANT). *(Taikiosen chosa hokokusho (Okishidanto)). Text in Japanese. Chiba-ken Kogai Kenkyusho Nenpo (Ann. Rep. Chiba Pref. Res. Inst. Environ. Pollut.), no. 4:30-33, 1972.*

The results of a survey on oxidant air pollution and meteorological conditions for the fiscal year 1972 are given. An air pollution monitoring system was put into effect from May 1 to Oct. 31, during which time 21 oxidant warnings were officially announced and 502 air pollution victims were reported. Generally speaking, oxidant concentration was high in April and May, and during the 12th and 13th hours of each day. The concentration of oxidants increased in proportion to the increase of suspended particulates in the air. The meteorological analysis explains the high concentration of oxidants in relation to the distribution of atmospheric pressure and surface winds. The report includes graphs showing high concentrations of oxidants in relation to wind direction and velocity.

60882 **APTIC NO. 83482**

Saitama Prefectural Environmental Pollution Research Center

THREE DIMENSIONAL SURVEY ON AIR POLLUTION. *(Taiki osen koiko rittai chosa). Text in Japanese. Saitama-ken Kogai Senta Nenpo (Annu. Rept. Saitama Pref. Environ. Pollut. Res. Cent.), no. 2:108-117, 1975.*

The results of a three dimensional area survey of air pollution conducted in 1973 in Saitama Prefecture are given. The object of the survey was to study factors related to the mechanism of the generation of photochemical smog. The survey was conducted using a helicopter loaded with analyzers to measure the vertical distribution of ozone concentration, and, over an extensive area, the horizontal distribution of ozone concentration. Ozone, sulfur dioxide, nitrogen oxides, hydrocarbons, and temperature were measured. Saitama prefecture s geographical location is easily influenced by wind and sources of ozone which are closely related to the photochemical reaction. The vertical distribution of ozone concentration varied greatly according to the time of day in the area below 1000 Z(m). The horizontal distribution was outstanding in east Saitama.

1974

60883 **APTIC NO. 76040**

Aleksandrov, N. N., M. A. Belyashova, and G. S. Guniya

SOME RESULTS FROM A STUDY OF THE MICROPHYSICAL CHARACTERISTICS OF LIQUID AEROSOLS FROM INDUSTRIAL EMISSIONS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 6 refs. Translated from Russian, 13p.*

A field procedure for measuring the mean diameter of liquid aerosol drops that condense from industrial plumes immediately after leaving the flue (due to low boiling point) gave results with a mean square relative error not greater than 6.5%. The size distribution is described, independently of distance from the source, by a normal law with a reliability of 0.9. The decrease in the mean diameter of the drops as distance from the source increases is described by a power function that takes into account wind speed and relative humidity. The density of particle precipitation and of the mass of liquid aerosol deposited per unit time on a unit of surface are also related to wind speed, which determines the elongation of the precipitation zone, and to relative humidity, with which the precipitation density varies directly. Specifications for a measurement impactor are given. Field procedure is described. There is a special interest in emissions of this kind from solutions of fluorine compounds. (Author conclusions modified)

60884 **APTIC NO. 79806**

Allee, Paul A.

AN ICE NUCLEI CONCENTRATION BENCHMARK NETWORK. *In: Atmospheric Physics and Chemistry Laboratory Collected Reprints 1973. National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Lab., 6p., Nov. 1974. 7 refs. (Presented at the International Conference on Weather Modification, Tashkent, USSR, Oct. 1-7, 1973.)*

GPO

An ice nuclei concentration benchmark network has been established in the western United States. Its purpose is to determine the climatological mean and variation for the ice nuclei concentration throughout the 17 westernmost of the United States and the north Pacific Ocean. It consists of field monitors at 19 locations likely to be free from anthropogenic sources of ice nuclei. Data accumulated during May, June, and July, 1973 are shown. Comparison of the monthly average values of the ice nuclei concentrations shows that the average concentration has been increasing at all the network stations during the months of May, June, and July with the exception of Lihue, Hawaii. No strong correlations between the daily ice nuclei concentration and local meteorological elements were found. No evidence of ice nucleus storms progressing across the network was detected. Monthly ice nuclei concentration averages at the network stations show a monotonic increase when related to the distance of the station from the seashore, which can be interpreted to indicate that the earths surface is a source of ice nuclei. (Author abstract modified)

60885 **APTIC NO. 80186**

Allee, Paul A.

ATMOSPHERIC PARTICULATE CONCENTRATIONS MEASURED OVER THE ATLANTIC OCEAN DURING THE 1969 BOMEX EXPERIMENT. *J. Rech. Atmospheriques, 8(3-4):947-955, July-Dec. 1974. 12 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Concentrations of Aitken nuclei (AN), cloud droplet condensation nuclei (CCN), and ice nuclei (IN) were measured over the Atlantic Ocean during the 1969 Bomex experiment. The AN concentrations from the surface of the ocean to an altitude of 12,000 feet varied from slightly less than 200 to about 350 particles/ml. The CCN varied from approximately 100 to 200/ml, and IN varied from 0.1 to 0.2/l. The AN and CCN concentrations were strongly correlated and were lower between 400 and 10,000 feet than either above or below this altitude range. The IN concentrations increased with altitude and were not correlated with AN and CCN. The atmosphere above the Atlantic Ocean and east and southeast of Barbados was free of industrial pollution. (Author abstract)

60886 **APTIC NO. 73493**

Bendersky, Mark S.

AIR POLLUTION MODELING S ROLE IN THE CHANGE OF MASSACHUSETTS BUREAU OF AIR QUALITY CONTROL REGULATION 5.1.3 AND A REFINEMENT OF THE HARVARD BEARG-MILLER AIR QUALITY PREDICTION MODEL. *Massachusetts Inst. of Tech., Cambridge, Dept. of Chemical Engineering, Thesis (M. Sc.), Oct. 1974, 163p. 85 refs.*

A chronological description of the decision making process that brought about a temporary relaxation of Regulation 5.1.3 of the Massachusetts Bureau of Air Quality Control which limits the sulfur content of distillate fuel oil to 0.3% is provided, with particular emphasis on the role of air pollution modeling in the decision making process. The Bearg-Miller air quality prediction model is refined relative to the parameter of grid size and it used to examine the effects of relaxing Regulation 5.1.3. Several programming errors are identified and corrected in the process of refining the grid size of the Bearg-Miller model, and it is demonstrated the area source section of the model does not adequately model area source contributions for sulfur dioxide. The correlation coefficient between observed and predicted concentrations in the refined model are too low to justify the model s use in policy making decisions. (Author abstract modified)

60887 **APTIC NO. 76219**

Benedict, B. J., J. E. Cermak, M. L. Corrin, H. W. Edwards, C. D. Gaige, L. O. Grant, T. Henmi, G. R. Johnson, P. C. Katen, D. J. Lombardi, S. L. Peterson, E. R. Reiter, R. J. Rosenvold, G. J. Schewe, R. K. Skogerboe, R. S. Thompson, T. G. Thornabene, D. R. Watkins, J. B. Wedding, H. G. Wheat, and R. L. Zimdahl

ENVIRONMENTAL CONTAMINATION CAUSED BY LEAD. *Colorado State Univ., Fort Collins, National Science Foundation Research Applied to National Needs Grant GI-34813X1 and GI-44423, 383p., Dec. 1974. 185 refs.*

Several areas of research dealing with lead pollution are described. Studies of atmospheric transport of lead include urban diffusion and modeling, short range diffusion, long range transport, and pollutant transport by cumulus clouds. The effects of city geometry upon contaminant dispersion in city streets were studied with scale models. A mathematical model is used to describe the flow and accumulation of automotive lead in the atmosphere and soil near a highway. The ice nucleation characteristics of automotive exhaust are being studied by both laboratory and field tests to determine the nature and extent of inadvertent weather modification effects that may be caused by lead and lead substitutes. The analytical chemistry segment of the project involves identification of lead species, determination of total lead, and atmospheric sampling. Studies concerning atmospheric chemistry include a field program tracing the movement of lead from a highway line source and development of gas chromatographic techniques for determining ambient lead alkyl concentrations. Experiments were carried out to measure uptake of tetraethyl lead by simulated atmospheric dust components in a flow system and to provide thermodynamic information through equilibrium lead alkyl adsorption measurements at low relative pressures over a range of temperatures. Effects of lead on bacteria were also studied. Other studies include effects of airborne lead on plants, immobilization of lead by soil, effect of lead sulfate on plants, and effects of soil composition on lead uptake by plants.

60888 **APTIC NO. 76021**

Berlyand, M. Y., M. G. Gol dberg, G. S. Guniya, M. M. Zashikhin, and R. I. Onikul

THEORY OF RADIATION SCATTERING AND ABSORPTION IN AN ESTIMATE OF GLOBAL ATMOSPHERIC POLLUTION FROM ACTINOMETRIC DATA. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 18 refs. Translated from Russian, 24p.*

An indirect method of determining aerosol content in a vertical column of the atmosphere, based on scattering and transport of solar radiation, is described. Approximate formulas, based on the solution of the transport equations for radiant energy, are given for the flux of scattered radiation onto the underlying surface, using the spherical and Rayleigh scattering indicatrix. Formulas are given for the planetary albedo and for scattering by the atmosphere. An analysis of actinometric observations on direct and scattered radiation is carried out in order to choose the cases most suitable for characterizing global aerosol content. These data indicate a trend toward increase of the aerosol content and the planetary albedo during the past decade. Thus, formulas for calculating direct and scattered radiation, taking into account the scattering and absorbing properties of the atmosphere, are developed. Components in the optical thickness of the atmosphere which are caused by scattering and absorption of solar energy are separated. The application of these formulas to analyzing the corresponding actinometric data breaks the ground for separating the estimates of the characteristics for dust content of the air from natural and artificial sources. (Author abstract modified)

60889 **APTIC NO. 76022**

Berlyand, M. Y., Y. L. Genikhovich, M. N. Zashikhin, and R. I. Onikul

PROCEDURE FOR CALCULATING POLLUTANT DIFFUSION FROM LINEAR SOURCES AND VENTILATION SLOTS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 9 refs. Translated from Russian, 27p.*

Modeling of diffusion of emissions from ventilation slots and shafts is described. The model takes into account the initial rise of the pollutant and instability of wind direction, and offers an analytic solution for arbitrary direction of air flux onto the linear source. The analysis supports the conclusion that ventilation slots are very ineffective diffusers of pollutants, despite some positive effects related to the horizontal spacing of the emissions. If the same quantities of air were directed into chimneys, the initial rise would be very large, but the surface concentrations small, and wind speeds strong enough to present a hazard would seldom occur.

60890 **APTIC NO. 76026**

Bezuglaya, E. Y. and V. V. Klingo

STATISTICAL METHODS FOR THE ESTIMATION OF THE INFLUENCE OF METEOROLOGICAL CONDITIONS ON POLLUTANT CONTENT IN THE ATMOSPHERE. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 11 refs. Translated from Russian, 21p.*

A concept of air pollution potential is developed to characterize the tendency of a given geographic region to be affected by atmospheric pollutants, as a function of the meteorological conditions of the region. A method for the quantitative estimation of potential distribution of pollutant concentrations is described. It is assumed that the value of the random magnitude of pollutant concentration for a constant quantity of emissions is distributed according to a logarithmic normal law. Known laws for the influence of meteorological conditions on the magnitude of surface pollutant concentration are used to determine the parameters of this distribution. Working formulas are given for determining pollution potential for an isolated source and for urban conditions, and numerical values for the pollution potential of cities in various geographical areas are given. Inversion conditions and strength of surface winds are the principal determinants of mean concentration levels of pollutants. (Author abstract modified)

60891 **APTIC NO. 80097**

Biscaye, Pierre E., Roger Chesselet, and Joseph M. Prospero

RB-SR, 87SR/86SR ISOTOPE SYSTEM AS AN INDEX OF PROVENANCE OF CONTINENTAL DUSTS IN THE OPEN ATLANTIC OCEAN. *J. Rech. Atmospheriques, 8(3-4):819-829, July-Dec. 1974. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

The Rb-Sr, Sr-isotope system technique was applied to samples of water-insoluble atmospheric dust to test its utility in answering two questions: the continental provenance of the dust, and the relative importance of eolian versus other contributions to deep sea sediments. Samples of atmospheric dust were taken during 2 Atlantic cruises: a north-south section from May-Oct. 1971 (Dakar-Walvis Bay-Azores) and an east-west section from Sept.-Oct. 1972 (Barbados-Dakar). The overall pattern of dust concentrations was consistent with the well-known strong Saharan plume at 10-15 deg N latitude, and extends westward to the Caribbean with average concentrations in excess of 10 microgram/cu m. The north-south track was relatively near the African coast but permitted some definition of the decrease of dust concentrations north and south of the main plume. From the 87Sr/86Sr ratios, the dusts from the Saharan plume are distinguished from a second plume, probably from the Kalahari desert of southwestern Africa. The ratios of dusts in the Saharan plume are indistinguishable from deep sea sediments in this latitude band. Adding Rb/Sr to the Sr-isotope ratios in an isochron plot permitted distinction between the dusts and deep sea sediments east of the Mid-Atlantic Ridge, and from the sediments underlying the Saharan plume but west of the Ridge. It can be concluded that, west of the Ridge, the eolian dust contribution to the sediments is strongly diluted by non-eolian sediment sources, confirming, with an independent provenance characteristic, conclusions derived from sediment mineralogical data. (Author abstract)

60892 **APTIC NO. 84323**

Boscak, Vladimir

STUDY OF COAL DUST DISPERSION IN WIND TUNNEL. *American Inst. of Chemical Engineers, New York, Dayton and Ohio Valley Sections and Air Pollution Control Assoc., Pittsburgh, Pa., Technical Committee on Energy-Environmental Interactions, Energy Environ., Natl. Conf., 2nd, Oxford, Ohio, 1974, p. 177-180. 17 refs. (Nov. 13-15.)*

A wind tunnel study of factors influencing the dispersion of coal dust from power plant outdoor storage piles was conducted. A mathematical expression was developed that gives coal dust dispersion as a function of wind velocity and coal particle size. The expression is valid for erosion as a mode of coal dispersion and gives the percent of coal dispersed as an exponential function of the Froude number and other parameters. Cohesion between coal particles played an important role in reducing dispersion when the maximum coal particle size was under 590 micron. A dust suppression chemical for the control of coal dust was also developed. (Author abstract modified)

60893 ***APTIC NO. 83789***

Brocco, D., V. Di Palo, and M. Possanzini

AIR POLLUTION AND PRECIPITATION. (L inquinamento atmosferico e le precipitazioni). Text in Italian. Rass. Chim., 26(6):344n353, Nov.-Dec. 1974. 12 refs.

Rain sample analyses in 5 polluted areas (Monte Capellino, Bagnacavallo, Macerata, Casaccia, and Ispra) and in 2 nonpolluted control areas, (Monte Cimone and Pian Rosa), indicated that concentrations varied from station to station depending on their proximity to pollution sources. Ammonia content was highest during the summer months while nitrates concentrations followed the reverse pattern. Sulfate content was greatest during the winter. At Casaccia, Ispra, Monte Capellino, and Macerata, sulfate concentrations were highest in windy conditions; Bagnacavallo, characterized by a stable atmosphere, was not subjected to long distance transport of pollutants. Low pH values were frequently obtained at Monte Cepellino, Ispra, and Macerata; the ratio of sulfuric and nitric acid was especially indicative of the acidity of the rain. To correlate the concentration of nitrogen in ammoniacal and nitric form (mainly produced naturally) with total precipitation, a mathematical equation was developed which can also be used for an area which is not affected by sources specifically producing these compounds.

60894 **APTIC NO. 76033**

Burenin, N. S.

SOME RESULTS OF AIR POLLUTION ON HIGHWAYS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 10 refs. Translated from Russian, 16p.*

Characteristics of carbon monoxide emissions from highways in cities are analyzed in terms of the transverse dimensions of the highway, traffic intensity, and wind speed and direction. Concentrations of CO tend to increase with decrease in the width of the highway and to vary directly with traffic volume and density, although variation also depends on daily meteorological changes, so that CO concentration may be less in the morning than for equal or less traffic in the evening, due to greater turbulence in the early hours. Partial correlation coefficients are calculated for three variables: CO concentration, traffic intensity, and several characteristics of wind speed. The contribution to the variation in CO concentration from traffic intensity and from wind speed are about equal for the highways investigated. A preliminary estimate is given for the variation of CO concentration on highways as a function of pollutant transport direction away from industrial sources. The magnitudes for the decrease in concentrations with distance from the highway are determined for two zones: one with width about equal to the transverse dimension of the part of the road used by vehicles, the second on the order of 100-200 meters. For the first zone the gradient of the decreasing concentrations is 0.54-0.62 mg/cu m per unit of distance; for the second zone it is 0.002-0.016 mg/cu m. Daily variation of ozone and oxidants around highways in cities is considered, and a relationship with cloudiness is noted.

60895 **APTIC NO. 84462**

Changnon, Stanley A., Jr.

PRIORITIES FOR RESEARCH ON INADVERTENT AND INTENTIONAL WEATHER MODIFICATION. *Illinois State Water Survey, Urbana, Weather Modif. United States Potential Probl. Interstate Action, Sioux Falls, S. Dak., 1974, p. 152-160. 9 refs. (June 10-12.)*

The METROMEX (Metropolitan Meteorological Experiment) at St. Louis, Mo. is described. It centers around a large dense rain gauge network designed as a circle to handle the highly variable storm motions which vary from south-south west to west and north west. Each network site has a recording rain gauge with an air sensor. The issue of downwind effects in rainfall is addressed by an area of less dense rain gauges extending out 60 mi east of St. Louis. The rainfall patterns for the summers of 1971-1972 show highs basically east and northeast of the city. The frequency of summer hailstorms and thunderstorms show an increase to the east. Cumulus cloud bases over the city are higher by 1000 to 2000 ft than they are over the rural areas. The summer raindrop distribution is greatly altered with more big drops east of St. Louis.

60896 **APTIC NO. 79716**

Delmas, Robert and Jean Servant

SOME ASPECTS OF THE OCEANIC ORIGIN OF CONTINENTAL AEROSOL. INFLUENCE ON THE CYCLE OF ELEMENTS IN THE BIOSPHERE. *(Quelques aspects de l apport oceanique de matiere au continent. Influence sur les cycles des elements dans la biosphere). Text in French. J. Rech. Atmospheriques, 8(3-4):861-871, July-Dec. 1974. 20 refs. (Presented at the International Symposium on the Chemistry of Sea-Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Data on the aerosol composition of rainwater and the oceanic origin of continental aerosols collected by the European Network on Atmospheric Chemistry for the period 1955-1966 are presented. The mean annual precipitation of rainwater-soluble elements along the 48 deg North parallel between Rostrenen, France and Vienna, Austria presents a steep gradient for chlorine and sodium, a shallow gradient for magnesium, and a barely perceptible gradient for water, sulfur, potassium, and calcium. The ratio of Cl/Na for European coastal stations equals 1.80; this value is lower for the United Kingdom and for the Scandinavian countries and higher for Western Germany, Austria, Belgium, Denmark, France, and Holland. The oceanic contribution to the cycle of elements in the biosphere is estimated on the basis of a biomass of plants with a mean productivity of dry matter equalling 0.15 g/sq cm/yr and having an elementary chemical composition identical to that of the angiosperms. The origins of soluble elements contained in European river waters are also discussed.

60897 **APTIC NO. 76314**

Ferrara, Vincenza

AIR POLLUTION AND SOLAR RADIATION. *(Inquinamento atmosferico e radiazione solare). Text in Italian. Riv. Meteorol. Aeronaut., 34(2):119-121, April-June 1974. 8 refs.*

The solar energy which reaches the ground can be an important parameter for evaluating the absorption and diffusion of solar radiation caused by the atmosphere in general and by air pollution in particular. With the use of a pyranometer and a mathematical analysis, it was determined that absorption and diffusion caused by aerosols and various chemical compounds are found for almost all of the solar spectra, and surpass that caused by water vapor; the presence of these pollutants also significantly affects the polarization of diffused solar radiation. A system is presented which uses pyranometers and a mathematical model to determine the contribution of aerosols and air pollutants in the lower atmosphere to these effects.

60898 **APTIC NO. 84389**

Freshwater, D. C.

AIR POLLUTION MEASUREMENT AND ENVIRONMENTAL CONTROL. INTRODUCTION TO POLLUTION. *Preprint, Loughborough Univ. of Technology (England), Dept. of Chemical Engineering, 14p., 1974. 13 refs.*

A general review of the global impact of anthropogenic air pollutants is presented. Activities which can affect the atmospheric temperature include: the emission of carbon dioxide, the production of aerosols and dust, and the release of heat from fossil fuel burning activities. During the last 50 yr the amount of CO2 in the atmosphere has doubled, though only about half of the CO2 produced by fossil fuel burning remains in the atmosphere. The burning of all readily available fossil fuels over the next 30-50 yr is estimated to be capable of increasing the earth s average temperature by 2-3 F, an amount sufficient to melt the ice caps in 20-30 yr. The amount of aerosols produced by man s activities is very small compared with those from natural sources. Such aerosols can act as condensation nuclei both for local rain formation and for photochemical reactions but are unlikely to exert any global effect. The production of dust is potentially capable of seriously affecting global climatic conditions by scattering radiation and decreasing atmospheric transparency, though there is no evidence to suggest that either of these effects need to be taken seriously.

60899 **APTIC NO. 83559**

Gage, Kenneth S. and William H. Jasperson

PROTOTYPE METRAC TM1 BALLOON-TRACKING SYSTEM YIELDS ACCURATE, HIGH-RESOLUTION WINDS IN MINNEAPOLIS FIELD TEST. *Bull. Am. Meteorol. Soc., 55(9):1107-1114, Sept. 1974. 5 refs.*

A protype METRAC balloon tracking system is described which yields accurate, high resolution results. The METRAC positioning system is a ground based radio location that makes use of the Doppler principle in order to track an inexpensive, expendable transmitter. A protype system was built and evaluated for the Environmental Protection Agency for use in the Regional Air Pollution Program. The prototype system was tested in a field test conducted in Minneapolis. The field test consisted of wind profiles derived from the METRAC system compared to wind profiles derived from simultaneous rawinsonde and theodolite tracking. The system is capable of providing vertical wind soundings of great accuracy. (Author abstract modified)

60900 **APTIC NO. 80325**

Gerakis, P. A.

MAN-MADE DISRUPTIONS OF THE CARBON DIOXIDE AND OXYGEN CONCENTRATION IN THE ATMOSPHERE AND THE ROLE OF PLANTS. *J. Environ. Quality, 3(4):299-304, Oct.-Dec. 1974. 8 refs.*

The effects of possible fossil fuel consumption on the carbon dioxide and oxygen concentration in the atmosphere were determined. Burning all the explored and mapped fossil fuels would deplete 0.66% of the atmospheric oxygen on a global basis. Wide atmospheric mixing prevents any localized danger from oxygen depletion in large human settlements. Emission of man made carbon dioxide to the atmosphere does not threaten to poison animal life on earth. A major part of the extra carbon dioxide is absorbed by the hydrosphere and a smaller part by plants, although the role of plants is not lasting because their increased biomass results in more carbon dioxide production. The part which remains in the atmosphere will theoretically raise the earth s temperature. The suggested increase in atmospheric turbidity may lower the temperature. Variation in the number of sunspots interferes with the effects of both those major factors. The long term climatic effects of increased CO2 concentrations in the atmosphere cannot be predicted quantitively. (Author abstract modified)

60901 **APTIC NO. 67106**

Gifford, F. A., Jr.

FURTHER COMPARISION OF URBAN AIR POLLUTION MODELS. *National Oceanic Atmospheric Administration, Oak Ridge, Tenn., Air Resources Atmospheric Turbulence and Diffusion Lab., Rept. 93, 9p., June 4, 1974. 10 refs.*

Results are presented from comparisons of the Air Resources Atmospheric Turbulence and Diffusion Laboratory Urban diffusion model with outputs of other models and with urban pollution data from Los Angeles County. Graphical plots are presented indicating the correlation of the predicted with the observed time pattern of carbon monoxide concentration from data averaged over eight CO sampling stations in Los Angeles County and the correlation of the predicted with the observed space pattern of CO concentration from data averaged over a 12-hour time period at each station. The simple ATDL model provides a reasonably high correlation of the space-averaged time concentration pattern as compared with most of the other models, but the hour-by-hour predictions of the simple model for each station exhibit considerably more variability than do all other models. A remedy is proposed involving the averaging of wind speeds for each hour over all stations prior to forming the time-pattern statistics and the averaging for each station over all hours prior to forming the space-pattern statistics. A correction is also presented to account for the diurnal march of stability in the simple ATDL model.

60902 **APTIC NO. 83599**

Goldman, Mark A.

CARBON DIOXIDE MEASUREMENTS AND LOCAL WIND PATTERNS AT MAUNA LOA OBSERVATORY, HAWAII. *J. Geophys. Res., 79(30):4550-4554, Oct. 20, 1974. 13 refs. (Presented at the AGU Annual Meeting, 54th, Washington, D. C., 1973.)*

Yearly average values of the carbon dioxide concentration as a function of wind direction were calculated. There was a yearly increase of 0.6-0.7 ppm/yr in the background CO2 concentration for the 1961-1968 period. The 1968-1971 period had an average increase about twice the earlier value, of over 1 ppm/yr, giving an overall average increase since 1961 of 0.8-0.9 ppm/yr, based upon downslope measurements. The increase is due to the annual rise in CO2 production from fossil fuels and cement manufacturing.

60903 **APTIC NO. 80035**

Gorchakov, G. I.

SELECTION OF CHARACTERISTIC PROPERTIES FOR THE CLASSIFICATION OF LIGHT-SCATTERING MATRICES. *Bull Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz. Atmosfery i Okeana), 10(12):812-814, Dec. 1974. 15 refs.*

Characteristic properties for the classification of light scattering matrices are selected for two types of optical weather: haze and foggy haze. The results of simultaneous measurements of three components of the reduced light scattering matrix for the optical wavelength lambda equals 550 nm are used. A method is proposed for objective classifcation of hazes and foggy hazes with the aid of three parameters: the relative air humidity and the differences betewen the degrees of linear polarization or, more precisely, between the values of the reduced scattering matrix component for scattering angles of 100 (pl) and 140 deg.

60904 **APTIC NO. 79891**

Hesek, Ferdinand, Dusan Zavodsky, and Peter Gabris

AIR POLLUTION IN SLOVAKIA. *(Znecistenie ovzdusia na Slovensku). Text in Slovak. Ochrana Ovzdusi, 6(8):105-108, Aug. 1974. 2 refs.*

The basic Sutton-Pasquille equation for calculation of average pollutant distribution was simplified and extended to cover longer distances from the source. The equation was used to write a computer program for calculation of sulfur dioxide distribution in Slovakia. Numerical data was obtained for all pollution sources with an output greater than 300 tons/yr; smaller sources were included on the basis of the height of their chimneys; extended sources were made proportional to the number of people. The data of 1970 was used to compute the distribution. The area quantization element was a square having a side of 3.75 km. It was established that the most polluted area is that of Horna Nitra where the average concentration of SO2 is 0.2 - 0.25 mg/cu m and where the area over which the allowable concentration of 0.05 mg/cu m is exceeded is 170 sq km. This region is followed by Bratislava and Koshice, where the concentration of SO2 reaches 0.05-0.075 mg/cu m.

60905 **APTIC NO. 76455**

Hesstvedt, Eigil

A SIMPLIFIED TIME-DEPENDENT TWO-DIMENSIONAL PHOTOCHEMICAL MODEL OF THE STRATOSPHERE. *Oslo Univ. (Norway), Inst. for Geophysics, Rept. 2, 17p., Jan. 1974. 5 refs. (Presented at the IAMAP First Special Assembly, Melbourne, Australia, Jan. 14-25, 1974.)*

A time-dependent, two-dimensional photochemical model of the lower stratosphere is presented along with computations of the effect of supersonic transports on stratospheric ozone levels. The annual cycle of radiation, transport, temperature, and pressure is considered; and meridional distributions of ozone, nitrous oxide, nitrogen oxides, nitric acid, hydrogen, carbon monoxide, and methane are presented. The results are in reasonable agreement with observations. The ozone distribution, however, differs considerably from steady-state results based on the same data. A much better reproduction is obtained for the high-latitude ozone maximum, in particular. Mixing ratios of methane, carbon monoxide, and nitrous oxide decrease with height and with latitude. A maximum mixing ratio of 10 to the -8 is calculated for nitric acid at an altitude of 24 km. Computed decreases in ozone with nitrogen oxide input rate are calculated for altitudes of 17 and 20 km. Ozone decreases ranging from 3.7-27.0% at 20 km are predicted for nitrogen oxide input rates ranging from 0.5-5 times 10 to the 12 tons/yr. (Author abstract modified)

60906 **APTIC NO. 81958**

Hino, Miko, Yoshikazu Mori, and Shinjiro Yoshikawa

PREDICTION OF ATMOSPHERIC POLLUTION BY KALMAN FILTER. *(Karuman firuta ni yoru taiki osen no yosoku). Text in Japanese. Doboku Gakkai Ronbun Shu (Trans. Japan Soc. Civil Eng.), no. 224:79-90, April 1974. 15 refs.*

The Kalman filter theory was applied to the prediction of atmospheric pollution. Brief descriptions of atmospheric pollution prediction models (physical and non-physical models), and evaluation criteria for a prediction model and a Kalman filter are given. Assuming that the atmospheric pollution system is an ordinary differential equation system, the optimum estimation for system parameters based on the Kalman theory was carried out, and the applicability to the actual atmospheric pollution prediction was evaluated. The constant difference system equation, rewriting and rereading of system equations and evaluation by simulation data are described. The Kalman filter was applied to atmospheric pollution prediction in the Kashima and Mizushima areas. The average diurnal variations of wind velocity and sulfur dioxide concentration and distribution of differences between measured values, average wind velocity, and SO2 concentration were obtained. The autocorrelation and cross-correlation of wind velocity and SO2 concentration were obtained and evaluated.

60907 **APTIC NO. 67103**

Holzworth, George C.

CLIMATOLOGICAL DATA ON ATMOSPHERIC STABILITY IN THE UNITED STATES. *Preprint, American Meteorological Society, 23p., 1974. 6 refs. (Presented at the American Meteorological Society Symposium on Atmospheric Diffusion and Air Pollution, Santa Barbara, Calif., Sept. 9-13, 1974.)*

Routine rawinsonde measurements, made daily by the National Weather Service for scheduled synoptic observation times of 0000 and 1200 GMT, were analyzed to determine temperature inversion and temperature lapse conditions in the lower 3 km of the atmosphere. The objective method for analyzing stability conditions determined from the rawinsonde observations is presented and used to simplify multiple or complex inversions. Summaries are presented of inversion conditions (base height, thickness, and variation of temperature with height) and, when no inversion occurred below 3 km, of variation of temperature with variation of height in specified layers. In all, ten categories of values of variation of temperature with height are used. The categories and summarization techniques are suitable for analysis of rawinsonde observations throughout the world. Examples of tabular summaries for three stations in the U. S. and isoplethed maps of several stability parameters are presented and discussed. These data should be of interest to persons concerned with climatological aspects of dispersion in the lower layers of the atmosphere. (Author abstract modified)

60908 **APTIC NO. 79590**

Jaenicke, R.

SIZE DISTRIBUTION OF CONDENSATION NUCLEI IN THE NE TRADE WIND REGIME OFF THE AFRICAN COAST. *J. Rech. Atmospheriques, 8(3-4): 723-733, July-Dec. 1974. 13 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Instrumentation was designed to study the aerosol size distribution of Aitken particles and applied to condensation nuclei in the northeast trade wind regime off the African coast. The instrumentation consists of a number of diffusion precipitators in connection with a continuous recording and condensation nuclei counter. This combination is optimized together with an evaluation program to measure the expected size distributions. In nuclei measured from the Cape Verde Islands there is a bimodel distribution with a maxima at 0.000002 cm and 0.00001 cm radium, separated by a pronounced minimum. This size distribution shows variations with meteorological parameters. Correlation calculations and detailed trajectory analysis of the air masses remain to be made. There is no explanation for this new shape of the size distribution at present. (Author conclusions modified)

60909 **APTIC NO. 79889**

Jirele, Vratislav

HYDROCHEMICAL PROBLEMS OF ENVIRONMENTAL PROTECTION. *(Hydrochemicka Problematika ochrany zivotneho prostredi). Text in Slovak. Miner. Slovaca, 6(3):249-254, March 1974. 8 refs.*

A hydrochemical model of environmental pollution is devised. It is pointed out that subterranean water is mainly polluted by rainwater reacting chemically with air polluted by industry. A definite correlation was observed between such air and subterranean water pollution in regions with high concentration of industry. Emissions from brown coal power plants contain fly ash with many metallic and other particles of which 60-80% are in the size range 2-10 micron. Sulfur dioxide reacts with rainwater and becomes sulfuric acid which dissolves these particles and carried them to the ground. The mineral content of rainwater in Czechoslovakia is around 0.1 mg/l which for an average yearly rainfall of 500-880 mm results in a deposit of 50-80 tons/sq km/yr of polluting minerals. Other sources of water pollution are agricultural chemicals and petroleum products.

60910 **APTIC NO. 79266**

Johnson, O., J. A. McCallum, and B. R. Larson

DIFFUSION AND DEPOSITION OF 30 MICRON PARTICLES FROM A LOW LEVEL SOURCE. *Defence Research Establishment Suffield, Ralston, (Canada), Proj. 20-90-03, Suffield Technical Paper 367, 44p., March 1974. 9 refs.*

A series of field trials on the diffusion and ground deposition of 30 micron glass microspheres from a continuous point source at a height of 2.75 m are discussed. The particles were collected on horizontal adhesive sampling surfaces placed on the ground. The observed crosswind integrated deposit density was a function of distance from the source was used to test two prediction models. One of these models employs appropriately averaged standard deviations of vertical turbulence as the main parameter of atmospheric diffusion. The other is the steady state K-Theory diffusion model with a coefficient of eddy diffusivity which varies with height. There was reasonably good agreement between the observed and predicted crosswind integrated deposit density as a function of distance for both models, although the sloping plume model tends to predict greater rates of deposition than observed, while the K-theory model predicts lower rates of deposition than observed. The observed data are somewhat better predicted by the sloping plume model, on the average. The standard deviation of the crosswind distribution of the deposit density was compared with the standard deviation from appropriately sampled and averaged crosswind turbulence data. There was reasonably good agreement between observed and predicted standard deviations although the former were consistently larger than the latter. (Author abstract modified)

60911 **APTIC NO. 81514**

Kitabayashi, Koji

WIND TUNNEL EXPERIMENTS CONCERNING STABLY STRATIFIED AIR FLOW OVER SLOPES. *(Antei seiso kiryu ni kansuru fudo jikken). Kogai (Hakua Shobo) (Pollution Control), 9(1 and 2):77-85, 1974. 13 refs. Translated from Japanese, 25p.*

Flow blocking phenomena in thermally stratified boundary layers over two-dimensional and three-dimensional slope models were studied using a wind tunnel. The critical Froude number below which a stagnant flow region appears upstream on the slope was estimated to be 1.4 by applying Pohlhausen s flow separation model, while it was calculated theoretically to be between 1.4 and 2.0. This number was far larger than that previously estimated using a nonviscous density stratified flow model. The flow blocking which occurred in front of the three-dimensional slope model appeared to be intensified by thermal stratification. (Author abstract modified)

60912 **APTIC NO. 83318**

Knox, George P.

APPARATUS FOR DISPERSING EFFLUENT GAS INTO THE ATMOSPHERE. *(Dow Chemical Co., Midland, Mich.) U. S. Pat. 3,841,208. 4p., Oct. 15, 1974. 5 refs. (Appl. Aug. 10, 1973, 3 claims).*

An apparatus for dispersing stack gas effluent into the atmosphere to reduce the concentrations of sulfur dioxide, nitrogen oxides, and fly ash to an acceptable level is described. A rotatable fan unit, is mounted on a platform above the outlet of a vertical stack. Waste gas discharged from the stack is propelled upwardly by the fan, a substantial distance into the atmosphere. Dispersing the effluent gas reduces the concentration of the polluting materials in the atmosphere to a safe level. Other methods for reducing SO2 content are not commercially feasible because they require costly equipment and materials. (Author abstract modified)

60913 **APTIC NO. 73594**

Koenig, L. Randall

A NUMERICAL EXPERIMENT ON THEE EFFECTS OF REGIONAL ATMOSPHERIC POLLUTION ON GLOBAL CLIMATE (INTERIM REPORT). *Rand Corp., Santa Monica, Calif., Defense Advanced Research Projects Agency Contract DAHC15-73-C-0181, Order 189-1, Rept. R-1429-ARPA, 88p., June 1974. 22 refs.*

NTIS, DDC: AD 783510

The 1973 Rand version of the Mintz-Arakawa computer code for modeling the general circulation of the atmosphere was used to study the consequencies off high concentrations of hygroscopic aerosols on global climate. The simulated abnormal conditions occurred over the North American continent, and the experiment was designed to investigate the potential activity of the aerosol as cloud condensation nuclei as well as the consequent abnormal production off cloudiness and alteration in precipitation. Cloudiness increased over the polluted area; and, inn response to an enhanced greenhouse effect, the temperature at the surface and in the lower atmosphere became warmer. Rainfall, however, was not significantly altered in the polluted region despite changes in the parameterization of rain making rainfall more difficult with a given set of circumstances. The compensating mechanism appeared to be a more unstable atmosphere accompanying the increased tendency for convective rain. The heated lower atmosphere in the polluted area also appeared to cause a circulation characterized by low-level inflow and high-level outflow. The total mass and moisture flow into the polluted region, however, was not exceptional, suggesting that changes in the atmospheric dynamics off the polluted region were not directly due to aerosol pollution. North American pollution appeared to have the effect of decreasing rainfall in the South American tropics, although the model did not properly simulate the hydrological cycle in the tropics. (Author summary modified)

60914 **APTIC NO. 73564**

Ku, Peh Sun

A COMPREHENSIVE MODEL STUDY OF SALT DRIFT DEPOSITS, INDUCED FOGGING AND ICING FROM MECHANICAL DRAFT COOLING TOWER PLUMES AT INDIAN POINT. *Consolidated Edison Co. of New York, Inc., New York, Nuclear and Emissions Control Engineering Dept., 91p., Oct. 1974. 13 refs.*

A diffusion model was used to quantify the environmental effects of mechanical draft cooling towers in terms of salt particulate deposition, induced fogging, and icing over an 18-sq mi surrounding area. The plumes investigated were saturated with water vapor and laden with entrained liquid draft droplets. Maximum salt deposits were estimated at 45,000 kg/sq km/month at high humidity. The occurrence of 82 hr of induced fogging and 97 hr of induced icing was also estimated for the 11-month period beginning October 1973 and ending August 1973. (Author summary modified)

60915 **APTIC NO. 83558**

Lazrus, A. L. and B. W. Gandrud

STRATOSPHERIC SULFATE AEROSOL. *J. Geophys. Res., 79(24):3424- 3431, Aug. 20, 1974. 27 refs.*

The sources of stratospheric sulfate concentrations are discussed. Increases in the aerosol concentration correspond with stratospheric intrusion of volcanic plumes. Diffusion of tropospheric sulfur containing gases and diffusion of sulfate Aitken particles into the stratosphere help maintain relatively steady sulfate concentrations. There are 2.1 times 10 to the 5th power ton of sulfate/hr leaving the stratosphere, which requires the injection of 1.4 times 10 to the 5th power tons of tropospheric sulfur dioxide to maintain the layer. Estimates for transport of tropospheric air into the stratosphere in the tropics vary considerably, and may reach a concentration of 1.0 ppbm SO2, which is higher than earlier measurements at much lower altitudes.

60916 **APTIC NO. 79238**

Lentz, W. J. and G. B. Hoidale

ESTIMATES OF THE EXTINCTION OF ELECTROMAGNETIC ENERGY IN THE 8 TO 12 MICRON RANGE BY NATURAL ATMOSPHERIC PARTICULATE MATTER. *Army Electronics Command, White Sands Missile Range, N. Mex., Atmospheric Sciences Lab., Task 1TO61102B53A-18, Rept. ECOM-5528, 27p., Jan. 1974. 23 refs.*

Extinction coefficients, based on atmospheric dust sampled over southern New Mexico, are tabulated at 0.2 micron intervals from 8.0 to 12.0 micron for mass concentrations of 1000, 100, and 10 microgram/cu m. The peak extinction of about 0.1/km occurs at 9.6 micron at a concentration of 1000 microgram/cu m. The method employed utilizes Mie theory to extrapolate the measured extinction of a suspension of dust in potassium bromide to the extinction of the dust suspended in air. Estimated concentrations of 1000 microgram/cu m and greater occur on an average of 50 to 150 days/yr near the ground over the Middle East and North Africa. (Author abstract)

60917 **APTIC NO. 80183**

Martell, E. A. and H. E. Moore

TROPOSPHERIC AEROSOL RESIDENCE TIMES: A CRITICAL REVIEW. *J. Rech. Atmospheriques, 8(3-4):903-910, July-Dec. 1974. 40 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Published estimates of tropospheric aerosol residence times based on the measurement of radon daughters, cosmic ray spallation products, and fallout radionuclides are reviewed and discussed. Substantial contributions to 210 plutonium in the trophosphere from various surface sources and from the stratosphere render 210Po observations inapplicable to tropospheric aerosol residence time estimation. The 210 bismuth/210 lead activity ratio data and the average 210 Pb concentration vs. altitude in the west-central United States correspond to residence times of about 1 week or less at all levels of the troposphere. Estimates yielding longer tropospheric aerosol residence times can be attributed to stratospheric aerosol contribution or may be questioned on other grounds. In the lower stratosphere, the residence time is about one month below 15 km, increasing appreciably with altitude above 15 km.

60918 **APTIC NO. 73363**

Misaki, I., G. Kanazawa, and M. Ikegami

DIFFUSION OF PARTICULATE MATTERS. *(Osen biryushi no kakusan). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 12:1-6, 1974.*

The particle size distribution of aerosol measured previously on the Tokyo--Ogasawara islands route indicated that the decrement of aerosol increased with particle size as the distance from the land increased. In order to separate the decrement due to the natural life of the aerosol and that due to the diffusion effect, the radon concentration was measured as well as the particle size distribution of aerosol on the Tokyo--Ogasawara route in April 1974. The variation in Rn concentration was analyzed in relation to the trajectory. The Rn concentration showed a logarithmic decrement with age. The apparent decrement rate measured is higher than the natural decrement rate of Rn, and the difference in these two decrement rates is interpreted to be the effect of diffusion. The relationship between particle size and decrement time constant calculated indicated that the decrement rate increased with the increase in particle size. The cause for higher decrement rate for larger particulates is attributable to rainfall based on Greenfield s study on removal of aerosol by rain and clouds.

60919 **APTIC NO. 80300**

Muller, K. H.

METEOROLOGICAL TRACERS IN REGIONAL PLANNING. *(Meteorologische Tracer in der Regionalplanung). Text in German. Commission of the European Communities, Ispara (Italy), Joint Nuclear Research Inst., Rept. EUR 5217d, 30p., 1974. 7 refs.*

NTIS: EUR 5217d

Mathematical and practical aspects of the use of meteorological tracers in pollutant diffusion studies in general and in regional planning in particular are presented. Fluorescent, radioactive or other tracers are suitable for the study of ventilation and pollutant dispersion studies around urban agglomerations. It is possible to derive transfer functions which consider the meteorological and topographic characteristics from the space-time concentrations measured through correlation analysis. Due to its low toxicity, great chemical and physical stability, sulfur hexafluoride is regarded as one of the best tracers for pollutant dispersion studies. A robot sampling system has been developed to reduce the manpower requirement in tracer studies.

60920 **APTIC NO. 80269**

Murphy, Thomas J. and Dennis J. Cesarotti

PHOSPHORUS INPUTS FROM THE ATMOSPHERE. *Preprint, DePaul Univ., Chicago, Ill., Chemistry Dept., 22p., 1974. 37 refs. (Presented at the American Society of Limnology and Oceanography, Annual Meeting, 37th, Seattle, Wash., June 27, 1974.)*

NTIS: PB 237 341

The precipitation scavenging of phosphorus from the atmosphere is shown to contribute 0.25 kg/ha/yr of total phosphorus in the Chicago area. Of this, 0.09 kg/ha/yr is in the form of ortho phosphate. These inputs are compared to inputs of phosphorus to Lake Michigan and to the inputs of phosphorus determined elswwhere by others. Some possible sources of this phosphorus are evaluated and no large local source is identified. Finally, the inputs in a remote area, Beaver Island, were also determined and compared to the inputs in Chicago. As much as 36% of the phosphorus going into the southern part of the lake and 23% going into the northern part is coming from the atmosphere. This is being distributed over the whole surface of the lake and a significant portion is the biologically available ortho phosphate. (Author abstract)

60921 **APTIC NO. 73200**

Nagayama, Tsutae, Hiroyuki Matsuda, Kazuo Koyata, and Kinji Hoshizawa

ACCURACY OF MEASUREMENTS ON STACK GAS CONCENTRATIONS BY FLUORESCENT PARTICLE METHOD. *(Keiko ryushiho ni yoru haigasu senbetsu no sokutei seido). Text in Japanese. Denryoku Chuo Kenkyusho Gijutsu Dai-ichi Kenkyusho Hokoku (Tech. Lab. Central Res. Inst. (No. 1) Electric Power Ind. Rept.), no. 73104:1-24, 1974. 13 refs.*

Fluorescent particles (inorganic matter, composed mostly of zinc sulfate were injected into stack gas, to obtain equivalent exhaust gas concentrations at a thermal power plant. The accuracy of results from eleven monitoring locations ranged from plus or minus 11% to 28%, with the average at plus or minus 16%. There is negligible adherence of fluorescent particles on the inner walls of the stack. Counting methods and collection methods influence accuracy. Comparisons of results from three tracer methods (fluorescent particles, sulfur hexafluoride (SF6), and cobalt sulfate) when all three types of tracers were injected simultaneously into stack, showed variations of about plus or minus 20%. The coefficient of variation for the fluorescent particle method was plus or minus 10%.

60922 **APTIC NO. 80298**

Nieuwstadt, F.

STABILITY CLASS CLIMATOLOGY IN THE GAUSSIAN PLUME MODEL. *(Stabiliteitsklasse-klimatologieen in het Gaussisch pluimmodel). Text in Dutch. Dutch Royal Meteorological Inst., De Bilt (Netherlands), Rept. V - 258, 25p., 1974. 5 refs.*

NTIS: N75-14351

The KNMI, F. B. Smith and D. B. Turner stability class climatologies are compared, and the relation of the long-term Gaussian plume model to the different stability class climatologies is investigated. The comparison shows considerable differences between the different stability class climatologies as a consequence of the different definitions of stability. The methods according to F. B. Smith and D. B. Turner result in a considerable reduction in the frequency of unstable events and in a corresponding increase in the frequency of stable events relative to the calculations according to the KNMI method. The long-term Gaussian model was found not to be sensitive to slight changes in the stability class climatology, as may be conditioned by the application of different definitions for the stability class.

60923 **APTIC NO. 81778**

Nordo, J.

QUANTITATIVE ESTIMATES OF LONG RANGE TRANSPORT OF SULPHUR POLLUTANTS IN EUROPE. *Ann. Meteorol., no. 9:71-77, 1974. 7 refs.*

Model studies of the long range transport of sulfur compounds were conducted in Scandinavia. Regional emissions of sulfur and instantaneous wind field measurements were used in conjunction with an equation of continuity to estimate sulfur pollutant transport. Both Eulerian and Lagrangian integration schemes were utilized. Critical parameters in the estimates proved to be the dry deposition rate and the conversion rate of sulfur dioxide to sulfate. Validation of the model estimates with surface observations indicated that the computed concentrations were in most cases within a factor of two of the measured concentrations. (Author abstract modified)

60924 **APTIC NO. 79249**

Panofsky, H. A.

REPORT ON THE ANALYSIS OF OBSERVATIONS OBTAINED DURING LARPP. *Preprint, Pennsylvania State Univ., University Park, 20p., 1974.*

Diffusion characteristics in the Los Angeles Basin are analyzed. The theory and the behavior of carbon monoxide, methane, and temperature are discussed. The analysis also yield surface fluxes of CO and heat. The first step in air pollution modeling in the Los Angeles basin should be an aerodynamic model, which specifies the distribution of wind and temperature in the basin from simple initial and boundary conditions. Given the distribution of wind and temperature, a simple pollution model is suggested for determining the distribution of nonreactive contaminants, given their source strengths. Reactive contaminants can be treated by adding terms to the equations used in this model. (Author abstract modified)

60925 **APTIC NO. 67134**

Patterson, Robert M. and James R. Mahoney

TRAFFIC MOTION CONTROLS AS AN EMISSION CONTROL TECHNIQUE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1974. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-3.)*

The development and evaluation of new modeling and analysis tools for evaluating the effectiveness of traffic motion controls to reduce motor vehicle emissions in urban areas are discussed, with special application to congested local peak emission areas. The method is to build a traffic flow submodel which computes detailed information on individual vehicle motions (acceleration, deceleration, cruise, and idle) through a string of signalized intersections, each with its own characteristic input parameters including signal phase times, offset, approach speed, departure speed, and turning fractions. The computed vehicle motions are then combined with an emission sub-model which calculates emissions based on driving speed and mode for all vehicle motions. The emissions from each vehicle are added at all points along the roadway to calculate spatially and temporally detailed emission profiles. A field study was performed at an urban street intersection to collect data for preliminary testing of the emission profile model. Emission profiles were generated by a model simulation of the traffic and signal conditions observed during the study. These were then input to a street canyon dilution model to predict carbon monoxide concentrations to be compared with those measured at three locations near the intersection. The average difference between observed and calculated 1-hour values was -20%. For a 3-hour average, the difference was -14%. The emission profile model was then used to analyze the effects of setting the bandwidth of a signal progression proportionately to unequal opposing traffic volumes and then giving the largest possible bandwidth to the heavier volume. The local, peak emissions and the total emissions were reduced at two out of three intersections, with an overall reduction for all three. This analysis example is especially applicable to rush hour, when traffic flow is predominately in one direction. (Author abstract)

60926 **APTIC NO. 73020**

Poje, Drazen, Nadezda Sinik, Edita Loncar, Nada Plesko, Gordana Hrabak-Tumpa, Zvonko Katusin, and Zdenka Bolanca

THE AIR POLLUTION IN ZAGREB IN RELATION TO METEOROLOGICAL FACTORS. *(Ovisnost Zagadjenosti Zraka u Zagrebu o meteoroloskim factorima). Text in Serbo-Croatian. Republican Hydrometeorological Inst. of the Socialistic Republic of Croatia, Zagreb (Yugoslovia), Rept. 347-M8, no. 11,241p., 1974. 47 refs.*

Air quality measurements made in Zagreb, Croatia are reported and correlated with climatic conditions. A detailed analysis of sulfur dioxide and smoke measured during the period 1966-1971 in the central part of Zagreb is tabulated. The SO2 concentration dependence on the fog density and duration as well as on the air minimum temperature was investigated. The mean seasonal air temperature areal distributions indicates a permanent existence of a heat island above the town. High SO2 and smoke concentrations appear in weather situations with weak flow and surface temperature inversions. Over an eight-day period in spring 1972, carbon monoxide, carbon dioxide, nitrogen dioxide, and SO2 and meteorological parameters such as air temperature, humidity, and cloudiness were measured at 40 cross-roads in the central part of Zagreb.

60927 **APTIC NO. 80034**

Popov, A. M.

PROPERTIES OF ATMOSPHERIC DIFFUSION OVER AN INHOMOGENEOUS UNDERLYING SURFACE. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 10(12):806-807, Dec. 1974. 5 refs.*

The solution of the turbulent diffusion equation in a porous medium was determined. The concentrations of a contaminant entering the atmosphere from a smoke stack at a height of 50 meter and from the plane ground level source (city auto traffic) were calculated. For a plane source situated in the roughness layer, a decrease in porosity results in a decrease in concentration, while producing the opposite effect for a source situated above the obstacle height. The interaction of the contaminant with the obstacles equalizes the concentrations in the roughness layer. At small enough porosities, the problem degenerates and the solutions coincide with the solutions of the diffusion equations with consideration of an underlying surface rise to obstacle height.

60928 **APTIC NO. 67075**

Quickert, N., G. Dowd, and J. L. Monkman

A DEVICE FOR AIR POLLUTION MONITORING OF AIR EARTH CURRENTS. *Preprint, Environmental Protection Service, Ottawa (Ontario), Chemistry Div., 24p., 1974 (?).*

The electrostatic condition of the atmosphere is continually varying in reponse to weather changes. Since electric fields may reach exceedingly high values, it is possible that they exert an influence on chemical combinations in the air. An instrument is described which uses field effect input operational amplifiers to measure the magnitude and polarity of air earth currents. It is designed to operate in conjunction with air pollution monitoring equipment, in particular, ozone and oxides of nitrogen monitors. Correlations between the electrical measurements and the gaseous concentrations are discussed. There is evidence to suggest that air electrical phenomena can be correlated to O3 ane NOx production during thunderstorms. Accurate conduction measurements should yield valuable data from a pollution point of view. (Author abstract modified)

60929 **APTIC NO. 75109**

Rasmussen, K. H., M. Taheri, and R. L. Kabel

SOURCES AND NATURAL REMOVAL PROCESSES FOR SOME ATMOSPHERIC POLLUTANTS (INTERIM REPORT). *Pennsylvania State Univ., University Park, Pa., Center for Air Environment Studies Environmental Protection Agency Grant 800397, Program Element 1A1009, Task 14, ROAP 800397, CAES 367-74, Rept. EPA-650/4-74-032, 129p., June 1974. 195 refs.*

NTIS: PB 137168/AS

The state of the art for the recognition of the various sources and sinks of gaseous pollutants is reviewed. Gases such as sulfur dioxide, nitrous oxide, nitric oxide, nitrogen dioxide ammonia, carbon monoxide, ozone, and hydrocarbons are considered in terms of the nature and size of anthropogenic and natural emissions, ambient background concentrations, major sinks identified to date. The information is supplemented with any quantitative data on removal rates available. Removal mechanisms reviewed include: absorption by vegetation, soil, rock, and water bodies; precipitation scavenging, and chemical reactions within the atmosphere. Total geochemical cycles can be prepared for sulfurous and nitrogenous compounds. (Author abstract modified)

60930 **APTIC NO. 80321**

Sadasivan, S., S. J. S. Anand, and K. G. Vohra

TRACE CONSTITUENTS IN THE MONSOON RAINS NEAR BOMBAY. *J. Rech. Atmospheriques, 8(3-4):873-882, July-Dec. 1974. 22 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Rainwater samples collected on a hill top on the windward side of a western range near Bombay were analyzed for sodium and halogens. The sampling site was 625 m above sea level and 60 km from shore. Most of the samples were collected near a cloud base and some of them in clouds. The results agree with those for Hawaiian orographic rains. The sampling was done in the peak south west monsoon month of July, and the short passage over land does not modify the composition. An average bromine/chlorine ratio of 0.0031 shows a slight Br depletion compared to seawater, whereas the iodine/Cl ratio of 0.0021 shows an abundant I enrichment. The enrichment factor for I (defined relative to Na) shows a definite decrease with increasing Na or Cl sea salt content. (Author abstract)

60931 **APTIC NO. 79670**

Sakagami, Jiro

ON THE VERTICAL CONCENTRATION DISTRIBUTION OF THE ATMOSPHERIC DIFFUSION. *Natural Sci. Rep. Ochanomizu Univ., 25(2):69-77, Dec. 1974. 3 refs.*

Data on vertical concentration profiles for heights of 2-8 m above ground are analyzed in an attempt to show that the vertical concentration profile cannot be assumed to have a Gaussian form. Concentration distributions are quantitatively determined by solving a Fickian equation which includes terms for the pollutant concentration, wind speed, leeward and vertical coordinates, and vertical diffusion coefficient. The results from vertical concentration distributions indicate that the vertical diffusion coefficient is not constant; rather, it is proportional to the height. Thus, the Gaussian form is inadequate to express the vertical concentration profiles in the atmosphere.

60932 **APTIC NO. 82860**

Sato, K. and J. Takeuchi

DIFFUSION OF AEROSOL PARTICLES IN ATMOSPHERIC BOUNDARY LAYER. *(Taiki kyokaiso ni okeru earozoru ryushi no kakusan). Text in Japanese. Aichi-ken Kogai Chosa Senta Shoko (Rep. Environ. Pollut. Res. Cent. Aichi Pref.), no 2:1-5, 1974. 6 refs.*

A numerical experiment on the diffusion of aerosol particles in adiatatic surface layer was conducted. The solution of diffusion equation for line source was integrated along the downwind distance and extended for the case of area source. The distribution of aerosol particles was calculated a function of height, atmospheric stability, and size of area source. The distribution of aerosol particles smaller than 10 micron in radius in the adiabatic surface layer depended greatly on the initial distribution function of area source, and the difference from the initial distribution pattern is very little, though it varied slightly with atmospheric stability. In the case of aerosol particles larger than 10 micron in radius, the particle concentration decreased markedly with the increase in distance from the area source.

60933 **APTIC NO. 79206**

Sehmel, G. A. and W. H. Hodgson

PARTICLE DRY DEPOSITION VELOCITIES. *Battelle Memorial Inst., Richland, Wash., Pacific Northwest Lab., Atomic Energy Commission Contract AT(45-1)-1830, 35p., Aug. 1974. 3 refs. (Presented at the Atmosphere-Surface Exchange of Particulate and Gaseous Pollutants 1974 Symposium, Richland, Wash., Sept. 4-6, 1974.)*

NTIS: BNWL-SA-5125

Particle deposition velocities were predicted from a steady-state one-dimensional mass transer model for a particle density of 1.5 g/cu cm and a reference concentration height of 1 m. The predictions were made over particle diameters of from 0.01-100 micron, roughness heights of from 0.0001 to 10 cm, friction velocities of from 10-200 cm/sec, and Obukhov s stability length criteria of + or - 10 m. Deposition velocities generally increased with an increase in either the friction velocity of roughness height. Minimum depositon velocities occurred in the range of 0.04-0.4 micron for all combinations of friction velocity and roughness height. Deposition velocities were nearly independent of particle diameter only in the 0.1-1 micron size range and increased rapidly above 1 micron. (Author abstract modified)

60934 **APTIC NO. 76023**

Son kin, L. R.

PROBLEMS OF BACKGROUND AIR POLLUTION FORECAST IN CITIES. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 17 refs. Translated from Russian, 12p.*

A pollution forecasting approach is described that considers the special conditions under which prolonged air stagnation in cities, coupled with an unstable stratification of the lower atmosphere, may be accompanied by a decrease, rather than an increase, of pollutant concentrations. The initial establishment of stagnation (wind speed 0-1 m/s and surface inversion) causes an increase of pollution level significantly more often than does the continuation of stagnation. For prolonged stagnant conditions, a successive increase of pollutant concentration in air is not observed, and if the stagnant situation lasts more than 2 days, the pollution may be lowered, especially during the morning hours, below corresponding levels of the previous day. Under conditions of morning calm, the chance of a subsequent increase of pollution is 59%, compared to 78% if the calm occurs with stagnation in the afternoon. In situations in which the calm is not accompanied by a stable stratification (as when surface inversions are destroyed on winter afternoons), there is even less probability of a subsequent increase of pollution: calm is not a characteristic condition for intense air pollution. A successive graphical regression method gives the most satisfactory analysis of these data for purposes of forecasting. Results of experimental forecasting are given.

60935 **APTIC NO. 84584**

Takano, S. and H. Numata

ON THE STIMULATING RAINWATER OBSERVED IN YAMANASHI PREFECTURE. *(Yamanashiken-ka ni oite hassei shita shigekisei amamizu ni tsuite). Text in*

Japanese. Yamanashi Kenritsu Eisei Kenkyusho Nenpo (Ann. Rept. Yamanashi Pref. Inst. Public Health), no. 18:80-85, 1974. 16 refs.

Complaints of eye pain were registered by middle schoolchildren during an evening drizzle on June 28, 1973 in Uenohara Town in Yamanashi Prefecture. The damage covered a relatively broad area and 115 patients were affected. Nearly the same damage covered a broader area of the Kanto region on July 1974 with numerous patients, the common subjective symptoms being eye pain when rain water contacts them, and bleariness with lachrymation. The same damage occurred in Shizuoka City on the afternoon of the same day, the rainwater showing strong acidity. Studies were carried out on the rainwater sampled from July 18, 1973 to July 22, 1974. Rainwater of pH 4.10-4.50 was most frequent (26.9%). The reason for the lower pH was presumed to be an increased content of sulfuric acid and a corresponding decrease of cations, especially calcium. The stimulation by rainwater of the ocular mucosa is presumed to be due to acidic condition, with pH of 2.00-3.00 and containing 50 ppm of sulfuric acid and a conductivity of 400 micromho/cm.

60936 **APTIC NO. 76027**

Vasil chenko, I. V. and B. I. Vdovin

APPLICATION OF METHODS OF AEROLOGICAL OBSERVATIONS IN THE STUDY OF AIR POLLUTION BY INDUSTRIAL EMISSIONS. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 21 refs. Translated from Russian, 8p.*

Aerological data on the parameters of pollutant dispersion (transfer in the flux, turbulent scattering, stratification, speed and direction of the flux, temperature and wind profiles) is of great importance in field studies concerned with the character and control of pollution from existing individual sources in cities, and with the environmental impact of proposed industrial construction in specific areas. Aerological profiles, such as temperature gradient, which permit comparison of altitude-oriented aerological data to the distribution of pollutant concentrations, are important in current studies of climate and pollution potential in many Soviet cities, where attempts at forecasting dangerous conditions (e.g., temperature inversion) are now underway. The use and shortcomings of radiosonde measurements are discussed. Observation from high towers is becoming widesppread in the USSR. Aerostats, tethered balloons, and airplanes that are used to study boundary layer and other atmospheric phenomena are described. The advantages and disadvantages of these measurement methodds and instruments and their suitability for different uses (city sources and air, impact statements for proposed industrial areas, non city areas) are reviewed.

60937 **APTIC NO. 84316**

Velds, C. A.

RELATION BETWEEN EMISSION RESULTING FROM BURNING FOSSIL FUELS AND POLLUTION OF SURFACE AND GROUND-WATER. *Bull. Inform. Eur. Fed. Protect. Waters (Zurich), vol. 21:69-71, Sept. 1974. 3 refs. (Presented at the Danger of Water Pollution through Air Symposium Proceedings, Lappeenranta, Finland, Sept. 10-12, 1973.)*

Contamination of surface and ground water as a result of air pollutant emissions generated by fossil fuel burning activities is discussed. The two principal mechanisms of air pollution-induced water pollution are dry deposition onto the soil with subsequent runoff and precipitation scavenging. The latter mechanism is more important and is estimated to account for 10 million kg of hydrogen ion/yr being returned to thee land and surface in the country of Netherlands as a result of sulfur dioxide washout. Precipitation pH values for various areas in the Netherlands are also estimated. Sulfur dioxide and nitrogen oxide emissions resulting from electrical power generation and space heating activities in the Netherlands are estimated for the period 1960-1980.

60938 **APTIC NO. 79801**

Weickmann, Helmut K. and Charles C. Van Valin

THE SOURCES AND SINKS OF WATER VAPOR IN THE STRATOSPHERE. *National Oceanic and Atmospheric Administration, Boulder, Colo., Environmental Research Labs., Rept. ERL 307-APCL 32, 34p., Oct. 1974. 54 refs.*

The average water vapor concentration in the lower stratosphere is about 2.5 ppmm according to the most reliable measurements. There is an average annual north to south gradient of less than 0.5 ppmm, a maximum mixing ratio over the Intertropical Convergence Zone of from 3 to 4.5 ppmm, and an increase of about 50% in the mixing ratio with increasing altitude up to the stratopause. The mother of pearl clouds occasionally observed in high latitudes are evidence that higher mixing ratios sometimes occur. Water vapor enters the stratosphere by three primary mechanisms: Hadley cell updrafts, including mean rising motions of large scale air masses, as well as severe convective storm penetrations of the tropopause over tropical regions; severe convective storm penetrations of the tropopause in the midlatitudes during the warmer months; and oxidation of methane introduced from the troposphere. Volcanoes are occasional minor sources of water vapor. Exchange of tropospheric and stratospheric air along the jet stream systems and tropopause breaks could represent a very large source of moisture. However, it is likely that in most cases the moisture is efficiently returned to the troposphere by poleward and downward motions. Removal of stratospheric moisture during the polar night by the formation of ice particles is the only sink mechanism which is specific for water vapor. The north to south gradient in stratospheric water vapor is due to the lower temperatures and the resulting greater effectiveness of the Antarctic sink. (Author abstract)

60939 **APTIC NO. 80180**

Wilkniss, P. E., D. J. Bressan, R. A. Carr, and R. E. Larson

CHEMISTRY OF MARINE AEROSOLS AND METEOROLOGICAL INFLUENCES. *J. Rech. Atmospheriques, 8(3-4):883-893, July-Dec. 1974. 24 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Marine aerosols were collected aboard ships over the Greenland Sea, the Caribbean, the North and South Pacific, and over the Ross Sea. The samples were separated into soluble salt and insoluble dust, and were analyzed for their chemical composition. Radon determinations and meteorological information used to characterize the type of air mass which was sampled. Correlations were observed between aerosol chemistry and air mass history over the ocean areas of the world, including such remote regions as the Ross Sea. Variations in concentration of materials of continental origin agree with pickup mechanism, and transport of dust and aerosols by frontal systems.

60940 **APTIC NO. 79046**

Wilson, W., A. Alkezweeny, D. Blumenthal, R. Charlson, D. Fox, P. Hanst, R. Hausar, D. Pashayan, J. Peterson, R. Semonin, D. Slade, R. Steinberg, K. Whitby, and W. Wood

LONG RANGE AEROSOL FORMATION AND TRANSPORT STUDY. *Environmental Protection Agency, Washington, D. C., Div. of Meteorology and Atomic Energy Commission, Washington, D. C., Div. of Biomedical and Environmental Research, Chem. Meteorol. Workshop-1974, Ft. Lauderdale, Fla., 1974, p. 38-45. (Jan. 14-18.)*

Basic requirements for long range aerosol formation and transport studies are presented. The first step toward an improved aerosol monitoring network involves the use of high volume samplers augmented by filter measurements of dry, non-volatile, fine particulate matter (below 2 micron in diameter) and optical measurements of suspended particulates which include volatile material lost during filter collection. Meteorological measurements are needed to improve the ability of the network to determine whether changes in measured loadings are due to changes in emissions or changes in meteorological variables. A minimum of eight stations, including four urban, two urban district background, one continental background, and one oceanic background, are suggested for a research measurements network.

60941 **APTIC NO. 84495**

Young, J. A., T. M. Tanner, C. W. Thomas, and N. A. Wogman

THE ENTRAINMENT OF TRACERS INTO CONVECTIVE CLOUDS AT 10 TO 13.5 THOUSAND FEET NEAR ST. LOUIS. *Battelle Memorial Inst., Pacific Northwest Labs., Richland, Wash., Atomic Energy Commission Contract AT (45-1)-1830, 14p., 1974 (?). 21 refs.*

NTIS: BNWL-SA-5116

Six inert tracers were released sequentially at 10 to 13.5 thousand feet near the edges of two convective clouds in the St. Louis area to determine whether air was being entrained into the clouds at these altitudes, and to determine the extent to which the particulate contaminants in the entrained air were being scavenged by the precipitation. Europium, ruthenium, and tantalum were released near the western edge of one eastward moving convective cell and iridium, rhenium, and gold were released near the western edge of a second cell located approximately 15 miles to the southeast of the first cell. The tracers were released by burning acetone or methanol solutions of the tracers in six aerosol generators mounted beneath a Cessna-411 aircraft. Indium and lithium tracers were also released below cloud base into the updraft of the second cell. The concentrations of the tracers in precipitation samples using a 25 by 36 mile network of 122 rain collectors were measured by neutron activation. The results indicate that the tracers released at 10 to 13.5 thousand feet near the upwind edges of the convective clouds nearly completely scavenged. The tracers evidently spread from cell to cell, since each tracer appeared in comparable amounts in the precipitation from both cells. Measurable concentrations of the tracers were present in precipitation at the eastward edge of the precipitation network 20 to 30 miles downwind of the tracer releases, indicating that the tracers were probably also present in precipitation falling further downwind outside the network. (Author abstract modified)

60942 **APTIC NO. 76032**

Zaytsev, A. S., Z. I. Ivanova, and S. A. Kon kov

SOME RESULTS OF OBSERVATIONS OF THE CONCENTRATION OF SULFUR DIOXIDE. *In: Atmospheric Diffusion and Air Pollution Problems, Voprosy atmosfernoy diffuzii i zagryazneniya vozdukha, Leningrad, Gidrometeoizdat Press, 1974, 225p. 7 refs. Translated from Russian, 4p.*

The daily variation and variability of concentration of sulfur dioxide, recorded continuously with automatic gas analyzers at 6 points in Leningrad in the Fall and Winter of 1971-1972, are analyzed as functions of wind direction and other meteorological factors. Over the entire period of observation and over all points, one maximum, in the afternoon, and one minimum at night, were observed in daily concentrations. The variations were not large (magnitude of concentration increased from 1.2 at night to 1.7 in the afternoon). Concentration levels and diurnal variation were smaller during weekends, when emissions from industrial sources are less. For north and west winds the SO2 concentrations are very low, even on weekdays; lower, for north winds, than the overall weekend averages. North and west winds bring relatively pure air from the Gulf of Finland. There is almost no daily variation in SO2 concentration for these winds, and accompanying weather conditions tend not to give rise to surface inversions, a stable atmosphere, or weak winds. For south winds, and especially for east winds, the concentration levels increased, due to low wind speeds (less than 2 m/sec), low emission sources operating from those sectors, and frequent inversions. For all wind directions, maximum concentrations in the city increase with increasing distance from the outskirts.

60943 **APTIC NO. 73179**

Osaka Environmental Pollution Monitoring Center (Japan)

ANALYTICAL SURVEY ON THE CAUSING MATERIALS AND OUTBREAKING STRUCTURE OF PHOTOCHEMICAL SMOG. *(Kokagaku sumogu no genin bushitsu oyobi hassei kiko no kaimei chosa). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), vol. 1:216-229, 1974.*

Investigation of the meteorological and pollution condition at the lower atmosphere was carried out in southern Osaka-fu including southern Osaka city, Sakaichi, Takaishi, Matsubara, Yao, Fujiitera, and Tomidabayashi from Aug. 1 to Aug. 5 and Aug. 28 to Sept. 2, 1972. Temperature, wind direction, wind velocity, sulfur oxide, and ozone concentrations were measured from 50 m to 2000 m above ground at various locations. Results revealed that: high ozone concentrations were observed elsewhere when high ozone concentrations were found in the upper layer at sea; upper layer ozone concentrations were generally higher than the oxidants concentrations in the morning; high ozone concentrations were observed at sea at 100-700 m; ground concentration increased when sea wind front invaded; and disturbance of current at 100-300 m was significant.

60944 **APTIC NO. 73181**

Osaka Environmental Pollution Monitoring Center (Japan)

SURVEY ON THE ENVIRONMENTAL POLLUTION MATERIALS TRANSFER BY LOCAL CURRENT. *(Kokuchi kiryu ni yoru osenbushitsu no iryu ni kansuru chosa). Text in Japanese. Kokagaku Sumogu ni Kansuru Chosakenkyu (Res. Rep. Photochem. Smog), vol. 1:230-238, 1974.*

Investigation on photochemical smog was carried out at Sakaichi and Takaishi city on Aug. 31 and Sept. 1, 1972. Ozone concentrations were not always high, but air pollutants stayed under stabilized layer. An increase of ozone was observed in the morning depending on meteorological conditions. Ozone concentrations increased on land and on sea in the afternoon. The increase of ozone concentration was due to disturbed current. An increase of sulfur dioxide was also observed on sea in the afternoon. Pollutants originally carried to the sea by land wind were returned to the land by sea wind according to current transfer study by sulfur hexafluoride. Diffusion of pollutants in the rare was over a large area and the ground concentration distribution depended on current and atmospheric stability. Non-methane hydrocarbons were at considerably high levels.

60945 **APTIC NO. 84258**

DISTRIBUTION RESULT AND OBSERVATION OF THREE DIMENSIONAL DISTRIBUTION SURVEY OF POLLUTANTS AND METEOROLOGICAL FACTORS. *(Osen busshitsu, kisho yoso no rittai bunpu chosa (joku chosa) kekka to kosatsu). Text in Japanese. In: Report of the Kanagawa Prefecture Area Air Pollution Survey Association, p. 187-279, Dec. 1974.*

Simultaneous and continuous observation of many locations in Kanagawa Prefecture were made by pilot balloon, non-lift balloon, helicopter, and smog meter from July 17-19 and July 27, 1973, and also from Jan. 21-25 and Jan. 29-31, in 1974. For the first half of the summer observation, 4 spots were selected and measured from 0900 to 1600 hr, and for the second half, 9 spots were measured from 0400 to 2000 hr. In winter, for the first half of the observation period, 4 spots were selected, from 0900-1300 hr on Jan. 21, and from 0900-1700 hr from Jan. 23-25, and from Jan. 29-31, 0900-1700 hr, on the hour. Observation of currents was made by helicopter and non-lift balloon Jan. 21-23, twice a day. Sea breeze from Tokyo Bay and Sagami Bay was observed July 17 at 600 m., higher than the S-SW wind that blows from the Pacific coastal area in the afternoon. Observation for 3 days showed that the distribution of ozone in the sky was closely related to the sea breeze and the three-dimensional distribution of temperature. The high concentration area corresponded to the upper limit of the sea breeze, and maximum concentration corresponded to the three- dimensional staying area of the wind in summer. In winter, the high concentration of air pollutants is reached when sea breeze from Tokyo Bay blows in, and it is important to grasp the three- dimensional structure of sea and land breeze in winter also. Observation showed that pollutants, which emitted to the sky above the sea, came to be highly concentrated in the coastal area, crossing the stabilized layer above the sea, and reaching the coastal area under the inversion layer.

60946 **APTIC NO. 84412**

California Air Resources Board, Sacramento, Technical Services Div.

AIR ANALYSIS COMMENTS. *Calif. Air Qual. Data, 6(2):24-33, April, May, June 1974.*

The oxidant episode in the South Coast Air Basin of June 27 and 28, 1974 is described. The max-hour oxidant concentration reached .40 ppm or more at nine air monitoring stations. The temperature aloft correlated highly with oxidant concentrations in the surface air layer. Warm air aloft is conducive to the formation and accumulation of oxidant pollution. The opposite situation prevails when there is cold air aloft. The air affected by max hour oxidant concentrations of .40 ppm or more extended 60 mi in an east-west direction.

1973

60947 **APTIC NO. 67152**

Bullrich, K.

THE ATMOSPHERIC AEROSOL AND ITS SIGNIFICANCE FOR ENERGY TRANSPORT AND CLIMATIC CHANGES. *(Das atmosphaerische Aerosol und seine Bedeutung fuer Energie-Transporte und Klimaaenderungen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Bad Soden, Germany, 1973, p. 50-57. 15 refs. (Oct. 17-18.)*

The effect of natural and anthropogenic aerosols on the energy budget and climate is discussed. Due to their relatively long residence time of about 30 days in the troposphere, aerosol particles can be transported to remote areas in the course of atmospheric circulation. The aerosol concentration is much higher over continents than over oceans in the lower 5 km-layer of the atmosphere. The residence time of aerosols in the stratosphere is much longer than in the troposphere. While the anthropogenic aerosol accounts for only 11.5% of the total output, it is concentrated on about 2.5% of the earth s surface, which implies a possible influence of anthropogenic aerosol on the climate and energy transport processes. The reduction of the solar radiation and albedo caused by aerosol particles is counteracted by light scattering and absorption processes taking place on the same particles, which means that the temperature- reducing and temperature-increasing effects of atmospheric aerosol largely compensate each other. Consequently, the effect of aerosol, including anthropogenic ones, on the heat balance, and on climate is presently negligible, but it may assume considerable proportion in the future due to the ever-increasing energy production with its concomitant aerosol output.

60948 **APTIC NO. 81940**

Calvert, Jack G.

INTERACTIONS OF AIR POLLUTANTS. *National Academy of Sciences and National Research Council, Washington, D. C., Assembly of Life Sciences, Health Eff. Air Pollut. Conf. Proc., 1973, p. 19-101. 93 refs. (Oct. 3-5.) (Presented to the Committee on Public Works, U. S. Senate, 93rd Congress, 1st Session.)*

The detailed events occurring in atmospheres polluted with nitric oxide, nitrogen dioxide, hydrocarbons, carbon monoxide, and aldehydes are considered. Nitrous acid is not necessary to account for initial rates of reactions forming smog. Only a relatively small perturbation of the general reaction scheme can be expected with paraffin hydrocarbon additions at the levels near those of the olefins. As aldehydes are removed from initial conditions for simulated smog, a small induction period appears in olefin removal and NO2, ozone, peroxyacyl nitrates (PAN) and nitric acid formation rates. Ozone, PAN, and HNO3 concentrations are considerably raised with aldehydes present initially. Aldehydes dramatically alter the variation of integrated oxidant and PAN levels with the initial olefinic hydrocarbon concentration. The relationship between nonmethane hydrocarbons and maximum 1 hr oxidant at low hydrocarbon levels could be a critical function of the aldehydes. Oxidant level at 2 hr of irradiation gradually increases from very low NO levels to 15 pphm, but further increases cause suppression of O3 formation. Relatively low CO levels in nitrogen oxides- hydrocarbon atmospheres do not dramatically affect product formation rates in simulation runs. Extremely high CO levels practically eliminated PAN formation. The theoretical mass balance of the compounds containing nitrogen formed in the simulated polluted atmosphere is discussed. The effects of sulfur dioxide addition on the reactions are considered. Products containing sulfur and nitrogen may be expected. The fraction of the mass of impurity reactants appearing as aerosol is small. Speculation is offered concerning possible health effects related directly to the reactive intermediates.

60949 **APTIC NO. 67059**

Driscoll, J. N. and J. F. McCoy

APPLICATIONS OF ION SELECTIVE ELECTRODES TO THE MEASUREMENT OF NITRATE AEROSOL CONCENTRATIONS IN THE ATMOSPHERE. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):36-39, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

Laboratory studies on the application of ion selective electrodes to the measurement of nitrate aerosol concentrations in the atmosphere are reviewed. Three different electrodes are being evaluated for the determination of dissolved nitrate. The first involves direct measurement of nitrate with a liquid ion exchange nitrate electrode. Halide interference with the electrode is eliminated by adding silver ion to the sample prior to measurement. The other two electrodes involve measurement of nitrate after reduction to nitrite or ammonia. The nitrite and ammonia electrodes represent a series of newly developed chemical sensing electrodes in which a hydrophobic gas permeable membrane is used to separate the collection solution from the internal filling solution of the electrode. The reactions of nitrite or ammonia with the internal filling solution change the pH and are sensed by pH measurement. The major advantages of the nitrite and ammonia electrodes are a tenfold increase of sensitivity over the nitrate electrode and interference free measurements.

60950 **APTIC NO. 67163**

Friedlander, S. K.

RELATING PARTICULATE POLLUTION TO SOURCES: FUNDAMENTAL PRINCIPLES. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-*

Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 113r116. 33 refs. (Oct. 17-18.)

Calculations relating the pollution aerosol to its sources are presented. Atmospheric particles in the size range 0.1-1.0 micron are relatively stable away from the immediate vicinity of sources over the time scale of hours equivalent to passage through an urban basin. Coagulation takes place slowly because concentrations are usually not high, and Brownian diffusion is weak in this size range. The particles are too small to sediment rapidly. For the 0.1-1.0 micron range, the particle size distribution of the aerosol can be calculated from the distribution of the primary sources and a suitable growth law. (Author conclusions modified)

60951 **APTIC NO. 83136**

Frimescu, M., N. Romanov, and I. Moroianu

METEOROLOGICAL ASPECTS OF AIR POLLUTION IN AN INDUSTRIAL ZONE WITH COMPLEX RELIEF. *(Meteorologische Aspecte der Luftverunreinigung in einer Industriezone with komplexem Relief). Text in German. Idojaras (Budapest), 77(5):284-289, Sept.-Oct. 1973. 2 refs.*

A method for the study of the effect of orographic features on the dispersion of pollutant emissions for areas with complex relief is presented. Systematic sulfur dioxide concentration and dustfall measurements were conducted in a 400 sq km area along with the study of such meteorological factors as wind speed, wind direction, atmospheric stability, and vertical transfer processes. The major pollution sources were metallurgical plants, a railroad station, and a power plant. Good agreement was obtained between measurement data and mathematical calculations based on a diffusion model. The measurement period must be at least 2 years for reliable and comparable results.

60952 **APTIC NO. 79832**

Gregorczuk, M.

THE EFFECT OF ATMOSPHERIC POLLUTION ON CLIMATIC CHANGES OF THE GLOBE. *(Wplyw zanieczyszczen atmosfery na zmiany klimatu kuli ziemskiej). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(2):1-12, 1973. 39 refs.*

NTIS: TT 73-54096/2

The possible influence of anthropogenic atmospheric pollution and heat emission on global climatic changes from the end of the 19th to the middle of the 21st centuries is considered. The most characteristic climatic changes during the next several decades will be under the influence of two factors: emission of artificial heat and increase in carbon dioxide concentration. The effect of aerosols suspended in the atmosphere on tendencies in the change of climate is not clear due to the fact that knowledge of radiation properties of these particles is at present extremely limited. Noticeably higher temperatures connected with increase in CO2 concentration and emission of heat can be expected toward the end of the 1980 s. Temperature increases following this period might increase due to declining ice cover, which will constitute an additional factor stimulating temperature rise. The warmer climate can result in a number of unfavorable consequences, among which a rise in sea level and changes in atmospheric circulation are the most important. (Author abstract modified)

60953 **APTIC NO. 81925**

Gyllander, Christina and U. Widemo

CONCENTRATION STATISTICS BASED ON EXPERIMENTAL DATA OF ATMOSPHERIC DIFFUSION. *International Atomic Energy Agency, Vienna (Austria) and World Meteorological Organization, Geneva (Switzerland), Phys. Behav. Radioact. Contaminants Atmos. Symp., Vienna, Austria, 1973, p. 121-133. 10 refs. (Nov. 12-16.)*

The computation of ambient concentrations of effluents released by nuclear facilities is discussed. The wind velocity and wind direction as well as the stability parameter which includes the temperature gradient and the free wind speed above friction level are required for determining the diffusion conditions of the lower atmosphere. Dispersion parameters are deduced as continuous functions of meteorological data. A generalized Gaussian plume formula is used to compute the ambient concentrations. Hourly mean concentration values collected for a total of 24,000 hr and obtained for each 10 degree sector are discussed in relation to the concentration contribution for a given direction. The use of frequency statistics is discussed in terms of obtaining concentration values which may be reached or exceeded with a given degree of probability for actual release data. (Author abstract modified)

60954 **APTIC NO. 48857**

Hiraoka, Masakatus and Y. Ikeda

PREDICTION OF AIR POLLUTION CONCENTRATIONS IN AN URBAN AREA. *(Daitoshi ikinai no kyokuchi taiki osen nodo yosoku ni kansuru kenkyu). Text in Japanese. Doboku Gakkai Ronbun Hokokushu (Proc. Japan Soc. Civil Engrs.), no. 209:63-71, Jan. 1973. 11 refs.*

Urban diffusion models have been improved to deal with the multi- source character of urban areas, the unevenness of the ground, the tall buildings, insolation, and temperature differences due to central heating. Mathematical models, calculation conditions, parameters for the models, and results of concentration calculations are described. Sulfur oxides were measured by the Osaka Prefectural Pollution Monitoring Center and results were compared with concentrations predicted by a mathematical model. More precise meteorological forecasting concerning wind, insolation, and other factors is needed in order to make accurate pollution forecasts. If data on air flow and temperature at a height a few hundred meters above the ground could be obtained, the diffusion mechanism could be described more accurately.

60955 **APTIC NO. 83130**

Kalpasanov, J. and G. Kurtschatowa

STATISTICAL STUDY OF THE ROLE OF CERTAIN METEOROLOGICAL FACTORS FOR THE AIR POLLUTION LEVELS. *(Statistische Untersuchungen der Rolle einiger meteorologischen Faktoren fuer den Grad der Luftverunreinigung). Text in German. Idojaras (Budapest), 77(3):161-164, May-June 1973. 18 refs.*

An attempt was made to establish correlations between certain meteorological parameters and the atmospheric lead, dust, phenol, cyanide and sulfur dioxide concentrations in an urban area (Sofia, Bulgaria) and a large industrial area (Kremikovtsi, Bulgaria) on the basis of systematic measurements of these pollutant concentrations and of air temperature, relative humidity, and wind speed. Correlations with factors ranging from 0.1 to 0.3 were obtained between air temperature and lead, temperature and SO2, relative humidity and lead, relative humidity and dust, relative humidity and SO2, wind speed and dust, and wind speed and phenol. The correlations were more pronounced in the urban than in the industrial area.

60956 **APTIC NO. 83919**

Kasprzycki, A.

LOCAL STATISTICAL MODEL OF THE AIR POLLUTION FORECASTING. *Idojaras (Budapest), 77(5):296-303, Sept.-Oct. 1973. 6 refs.*

A local statistical model for air pollution forecasting was developed and applied to sulfur dioxide data in the Silesia Region, Poland. In this model the space time field of obtained air pollution data is divided into two parts in which one part is independent of time and the second independent of space. The model is capable of quantitative forecasting of the weather and/or pollution.

60957 **APTIC NO. 81515**

Kitabayashi, Koji, Shigeo Shimogata, and Kiyoshi Sugawara

A STUDY OF TURBULENCE AND DIFFUSION CHARACTERISTICS OF NEUTRAL AND STABLY STRATIFIED BOUNDARY LAYERS IN WIND TUNNEL. *(Anteiseiso kyokaiso to kakusan no fudojikken). Kogai (Hakua Shobo) (Pollution Control), 8(5):29-40, 1973. 8 refs. Translated from Japanese, 28p.*

Turbulence and diffusion characteristics within neutral and thermally stratified boundary layers were studied using a wind tunnel. The wind tunnel floor was covered with a wire mesh roughness element (mesh size of 3.5 mm). The thermally stratified boundary layer experiment was conducted with the floor temperature cooled to 0 C, the air temperature set to about 28 C, and the wind velocity set at 2.5 m/sec. Flow properties such as the velocity profile and the spectral energy distribution of turbulence were similar to those occurring in real atmospheres for the thermally neutral boundary layer experiment. However, the velocity and turbulence properties were not similar to their atmospheric counterparts for the thermally stratified flow experiments. Diffusion properties were qualitatively similar to those of real atmospheres, indicating a strong dependence of plume dispersion on turbulence velocity. (Author abstract modified)

60958 **APTIC NO. 84259**

Lehmann, A.

CALCULATION OF CONCENTRATION FIELDS AS A BASIS FOR TERRITORIAL PLANNING. *(Die Rechnerische Ermittlung Von Immissionsfeldern Als Bewertungsgrundlage Fuer Die Territorialplanung). Text in German. Idojaras (Budapest) 77(3):149-154, May-June 1973. 3 refs.*

Meteorological aspects of air pollution problems involving objectivity, reproducibility, homogeneity, comparability, and validity of statements is discussed. Mathematical procedures applied by meteorological institutes to accommodate expanded practical requirements and simultaneous redefinitions of evaluation standards are reviewed based on a reassessment of mathematical models used so far with regard to the continued utilization of the parameters enumerated under changing aspects. The Bosanquet - Pearson Expansion Formula, in use since 1958, is unsatisfactory. The formula is not very helpful in the determination of local air pollution levels. Another fundamental model for spreading calculations of pollutants was developed comprehensive enough to permit utilization of results derived from foreign expansion experiments, easy to manipulate with a general formula of broad applicability and capable of enlargement to include new findings and meteorological data. The fundamental model was based on a 2-dimensional Gauss nomogram with wind-speed in the expansion layer considered a mean over an exponential distribution and dispersal parameter sigma as a function of distance from the pollution source. For the calculation of higher chimney elevation, a formula was applied containing a term relating to parameters on the emission site, another one to correct the effect of the stability of atmospheric stratification on the development of effective height. Characterization of spreading conditions was provided by wind direction, wind velocity, and degree of stability. The latter was determined from synoptic weather observations according to Uhlig s Model, which was applied and improved by the Meteorological Service of East Germany.

60959 **APTIC NO. 79250**

Ludwig, Francis L., Samuel Schecter, Robert C. Robbins, and James Hart Smith

CONDENSATION NUCLEI AND AEROSOL POPULATIONS RELATED TO FOG FORMATION (FINAL REPORT II). *Stanford Research Inst., Menlo Park, Calif., Army Research Office Contract DAHCO4-67-0059, Proj. 6676, 212p., Dec. 1973. 80 refs.*

NTIS, DDC: AD776404

Fog droplets and associated aerosols were studied. Size distributions were determined at six San Francisco Bay Area locations. Droplets were more numerous and smaller in air containing urban contaminants than in unpolluted marine air. The sulfur or nitrate to chloride ratios were greater than seawater values at all sites. The differences were more pronounced in the smaller particles, especially for sulfate-to- chloride ratio. Sulfur isotope ratios in the aerosols and droplets showed that the marine air contains considerable particulate sulfur material that is significantly lighter than urban, or seawater sulfur compounds, indicating biogenic origins for particulate sulfur compounds in unpolluted marine air. Aerosols of sodium chloride in water solution were mixed with nitrogen dioxide and sulfur dioxide in a fog chamber. An impactor-filter contamination took samples to determine the nitrate to chloride and sulfur to chloride ratios in the larger and smaller droplets. Chloride is released from droplets formed on NaCl nuclei in an atmosphere containing NO2 or SO2. The efficiency of the SO2 process was greater for the smaller droplets. The hypothesized chemical reactions involve the oxidation of the gases to their acid form, absorption by the droplets, and release of hydrogen chloride gas. Numerical modeling studies included treatment of the variations in van t Hoff factor during the initial phases of condensation. Condensation began at a lower humidity and proceeded more rapidly for NaCl nuclei than for ammonium sulfate nuclei. After saturation is exceeded, the droplets forming on the two types of nuclei approach the same size. (Author abstract modified)

60960 **APTIC NO. 82732**

Machta, L.

ARGON-37 AS A MEASURE OF ATMOSPHERIC VERTICAL MIXING. *In: Noble Gases. Richard E. Stanley and A. Alan Mogissi (eds.), Washington, D. C., Environmental Protection Agency, 1973, p. 58-68. 6 refs. (Presented at the Environmental Protection Agency and Nevada University Symposium, Las Vegas, Nev., Sept. 24-28, 1973.)*

The use of argon-37 as a measure of atmospheric vertical mixing is discussed. Cosmogenic argon-37 distribution in the atmosphere is determined by its production, decay, and atmospheric transport. If the first two processes are known, the observed distribution of argon-37 may be used to determine global scale atmospheric transport. The atmospheric transport, as a first approximation, assumes that the flux of argon-37 lies in the direction of its gradient of concentration. The proportionality factor, called the eddy diffusion coefficeint, is related to atmospheric turbulence. Using estimates of cosmic ray production of argon-37 and data from observations of minimum concentrations of argon-37, it is shown that the likely global vertical diffusion coefficient averages about 50,000 sq cm/sec. (Author abstract modified)

60961 **APTIC NO. 84017**

Meszaros, Erno

CHEMICAL COMPOSITION OF PRECIPITATION WATER IN CENTRAL EUROPE. *(A csapadekviz kemiai osszetetele Kozep-eruopaban). Text in Hungarian. Idojaras (Budapest), 77(1):35-47, Jan.-Feb. 1973. 14 refs.*

The concentrations of the sulfate, calcium, ammonium, chloride, and nitrate ions in precipitation water are presented for central Europe for the winter and summer seasons. The data consist of non-simultaneous average values of 23 measuring stations situated in Austria, the Federal Republic of Germany, Czechoslovakia, the German Democratic Republic, Hungary, and Poland. A correction was developed for the elimination of the influence of meteorological factors which are independent of air pollution, and the corrected values are mapped. The problem of the connections existing between concentrations in the precipitation water and those in the air is investigated. The concentrations observed within the lowest air layers are in no close connection with the values observed in the precipitations.

60962 **APTIC NO. 84018**

Meszaros, Erno

THE ANNUAL MARCH OF THE CONCENTRATION OF TRACE CONSTITUENTS IN PRECIPITATION WATERS OVER HUNGARY. *(A csapadekviz nyom anyag koncentraciojanak evi menete mgyarorszagon). Text in Hungarian. Idojaras (Budapest), 77(5):304-319, Sept.-Oct. 1973. 14 refs.*

The average annual changes of the concentration and deposition of different components in precipitation waters collected monthly in four Hungarian stations during 5 years are presented. The annual changes for the concentration of different ions are characterized by a spring maximum. This maximum is explained by the fast oxidation of sulfur and nitrogen dioxide caused by stratospheric ozone in air and/or in liquid water. These processes lead to the increase of the hydrogen ion concentration of the cloud and precipitation waters, resulting in the faster absorption of ammonia gas and in the conversion of soil compounds to soluble salts. The measure of these processes depends upon the pollution of the troposphere produced by natural and man-made sources. The effect of man-made sources is particularly important since it forms a winter maximum.

60963 **APTIC NO. 83135**

Narai, K.

COMPUTER MODEL OF TURBULENT DISPERSION OF PARTICULATES. *(Computermodell ter turbulenten Dispersion von Teilchen). Text in German. Idojaras (Budapest), 77(4):224-231, July-Aug. 1973. 5 refs.*

A computer model for the determination of the distribution of sedimentation of particles around industrial stacks and practical testing of the model are presented. The model is based upon a general diffusion equation developed for gaseous pollutants emitted from a source continuously, which is completed with a factor expressing the gravitational sedimentation of particles. The reliability of the theoretical model computations was confirmed by measurements performed at 50 sampling sites in a 10 km-radius around a cement work during a 6-month period. Good agreement was obtained especially for sedimentation rates exceeding 10 g/sq m/mo, while the calculated sedimentation was usually higher than the measured values.

60964 **APTIC NO. 84346**

Perrin, R.

AIR POLLUTION AND LOCAL CLIMATOLOGY IN THE FOS-BERRE REGION. *(Pollution de l air et climatologie locale dans le secteur Fos-Berre). Text in French. Mediterranee, 12(1):107-118, 1973. 3 refs.*

The Fos-Berre industrial zone and port encompasses metallurgical, chemical and petrochemical, and energy installations. A number of refineries also located right outside the zone; in 1972, sulfur dioxide emissions were 400 t/day. A study of the diffusion of the polluting emissions shows that the mistral wind blows the pollutants towards the southeast and the high sea while the south and southeast winds blow the pollution inland. Thermal inversions of air sheets and calms make the gases stagnate.

60965 **APTIC NO. 67076**

Ragland, Kenneth W. and J. Jeffrey Peirce

AIR POLLUTION DUE TO HIGHWAY TRAFFIC. *Wisconsin Univ., Madison, Inst. for Environmental Studies, National Science Foundation, Research Applied to National Needs Grant GI-29731, NSF-RA-E-73-025, Working Paper 13, 38p., Sept. 1973. 9 refs.*

NTIS: PB 228691

A mathematical model is presented for the atmospheric dispersion of pollutants from highway traffic. It overcomes many of the limitations of the Gaussian plume mode. A rational scheme is presented for calculating wind and diffusivity profiles, in contrast to using the Gaussian dispersion coefficients which are dependent in an unknown way on the local surface roughness. The wind may be parallel to the roadway or at an anglye to the roadway. The width of the roadway is also taken into account. The ambient air concentration of pollutants is obtained by numerical solution of the differential equation for conservation of mass of a dilute species. The results of the calculations for 23 major routes in Madison, Wis., are shown in an appendix. (Author abstract modified)

60966 **APTIC NO. 76047**

Schneider, T., N. D. van Egmond, H. J. van de Wiel, A. C. Posthumus, M. van Leeuwen, P. Steenbergen, J. van Straaten

AIR POLLUTION CASE STUDY OF THE SOUTH HOLLAND REGION - FIRST PHASE (1973). *National Institute of Public Health, Bilthoven (Holland), 105p., 1973 (?).*

Air quality and meteorological parameters were measured in South Holland during 1973, with special emphasis on the components of photochemical smog. At Vlaardigen, the highest concentrations of most pollutants, especially acetylene, were found during the morning on days when atmospheric conditions were unstable. Winds from the north caused higher concentrations of the acetylene from traffic emissions. Winds from the southwest were accompanied by maximal concentrations of nitrogen dioxide, isobutane, butane, and propane, indicating that these pollutants originate at some distance from the measuring point. Higher concentrations of nitric oxide and ethene were found at very low wind velocities. The NO:NO2 ratio diminished with higher wind velocity for winds from all directions except the south-southeast. For higher wind velocities from this direction, a relatively high NO concentration was found, which might have come from a nitrogen oxides source at some distance from the station. Highest NO concentrations were found near highways. Data from mobile measurement units indicate that ground level concentrations of NO and NO2 in Vlaardingen originated from the Rijnmond industrial region 50% of the time; these pollutants can be traced to that source only 25-30% of the time in the Rotterdam-Schiedam region. Measured sulfuric acid concentrations were low. The small stinging nettle proves more sensitive than lettuce or grass to the effects of peroxyacetyl nitrate in the Westland region, and is a suitable plant indicator; tobacco was especially sensitive to ozone; and gladiolus and freesia were damage-sensitive to hydrogen fluoride. Hourly pollution measurements arranged in score diagrams facilitated the analysis of the interaction of pollutants with meteorological variables.

60967 **APTIC NO. 84422**

Sorbjan, Z.

ATMOSPHERIC POLLUTION AND THE CLIMATE OF CITIES. *(Zanieczysczenia atmosfery a klimat miast). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(6):46-52, 1973. 12 refs.*

NTIS: TT 73-54096/6

The relationship between atmospheric pollution and the climate of cities is discussed. Singularities in the distribution of temperature, wind, and turbulence depend in a specific way upon atmospheric pollutants, and exert a basic influence on dissemination of pollutants. Increased, repetitive inversion of upper temperatures and weakening of winds in the built-up areas of urban centers, together with the occurrence of mists, lead to higher concentrations of pollutants at ground level. These effects cause an increase in contrasts between the climate of cities and their suburban areas. There is a specific linkage consisting of the influence of pollutants on the climate of cities and the simultaneous reaction of climatic conditions on dissemination of pollutants. (Author conclusions modified)

60968 **APTIC NO. 67146**

Wesolowski, J. J., B. R. Appel, A. E. Alcocer, P. K. Mueller, R. Ragaini, and R. Kaifer

CHEMICAL MEASUREMENTS OF CALIFORNIA ATMOSPHERIC AEROSOLS. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 13-19. 32 refs. (Oct. 17-18.)*

The measurements of the chemistry of aerosols in California ambient air are reviewed. Measurements are needed to determine what control program to use to reduce the deleterious effects of air pollution on visibility and public health. They are closely related since the size range which scatters light and reduces visibility is also respirable and has a large mass concentration. Examples of measurements of the concentrations of specific elements as a function of time, space, and particle size were related to specific objectives: the identification of an industrial polluter, the determination of the representativeness of sampler location, and the determination of the production mechanism for specific elements in particulate matter. Experimental evidence is presented that the use of non-sticky collection surfaces on size-segregating impactors causes sufficient inaccuracies to make the determination of production mechanisms based on the size distributions measured invalid. (Author summary modified)

60969 **APTIC NO. 78359**

Yoshida, Tadataka

PHOTOCHEMICAL SMOG IN GIFU CITY. *(Gifu-shi no kokagaku sumoggu). Text in Japanese. Tokan Gijutsu Nyusu (Tokan Technol. News), no. 34:34-39, Dec. 1973. 1 ref.*

The oxidant concentration data obtained in Gifu City from May to August 1973 are analyzed in relation to meteorological factors. The diurnal variation in oxidant concentration was nearly parallel to the temperature variation, and the maximum monthly average was in the range of 30 ppm micron. The plotting of oxidant concentration versus duration of sunshine showed a relatively good correlation in a 1-8-hr range with a correlation coefficient of +0.53. The relationship between the daily maximum oxidant concentration and daily average oxidant concentration was linear with a correlation coefficient of +0.75. The analysis on the relationship between velocity and wind direction and maximum daily oxidant concentration indicated that the high concentration tended to occur at lower wind velocity and at S-SW wind. The plotting of maximum daily oxidant concentration and maximum temperature indicated no incidence of oxidant concentration above 40 ppm micron on rainy-cloudy days. The oxidant concentration did not necessarily increase proportionally to maximum temperature increase. However, the oxidant concentration by maximum temperature increased with temperature. The meteorological conditions for high oxidant concentration (0.1 ppm) in Gifu city were clear weather with more than 8 hr of sunshine, low wind velocity with SSE-WSW wind at noon to 3 pm, and a maximum temperature above 31 C.

60970 **APTIC NO. 84425**

Zimny, H.

THE EFFECT OF GAS EMISSION OF THE PETROCHEMICAL INDUSTRY ON THE ENVIRONMENT IN VICINITY OF PLOCK. *(Wplyw emisji gazowych przemyslu petrochemicznego na srodowisko w rejoni plocka). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 7(6):27-31, 1973. 2 refs.*

NTIS: TT 73-54096/6

The effect of gas emission of the petrochemical industry on the environment in the vicinity of Plock, Poland was investigated. Sulfur dioxide concentrations in the air at a level of 2 m ranged from 0.002 mg/cu m to 0.372 mg/cu m. The highest concentration of SO2 occurred in the region north and east of the combine, lowest in the west and south. The SO2 concentration did not exceed levels allowable for industrialized regions, but at times pollution of the atmosphere exceeded this level two-fold. The effect of emission of the petrochemical industry on vegetation and the environment was low; only the most sensitive plant species, coniferous trees, and lichens on trees showed symptoms of poisoning. (Author conclusions modified)

1972

60971 **APTIC NO. 42197**

Busch, George E. and Kent R. Wilson

TRIATOMIC PHOTOFRAGMENT SPECTRA. II. ANGULAR DISTRIBUTIONS FROM NO2 PHOTODISSOCIATION. *J. Chem. Phys., 56(7): 3638-3654, April 1, 1972. 48 refs.*

The angular distribution of recoil of oxygen atoms from the photodissociation of nitrogen dioxide at 28,810/cm is presented and analyzed to obtain information about the lifetime and symmetry of the excited dissociative state. The theoretical effects on photofragment angular distributions of excited state symmetry, lifetime, angular momentum, and angular recoil distribution with respect to internal coordinates are considered. The actual angular distribution measured by photofragment spectroscopy, peaks in the direction of the electric vector of the light, indicating that the predominant upper state is of 2Bsub2 symmetry. Some absorption leasing to states of different symmetry cannot be excluded. An upper limit for the lifetime of the excited NO2 molecule before dissociation is approximately 2 times 10 to the -13th power sec, indicating that break-up is too rapid to be affected by collisions in the atmosphere where NO2 photodissociation is an important step in photochemical air pollution. (Author abstract modified)

60972 **APTIC NO. 76258**

Cawse, P. A. and D. H. Peirson (eds.)

AN ANALYTICAL STUDY OF TRACE ELEMENTS IN THE ATMOSPHERIC ENVIRONMENT. *Atomic Energy Research Establishment, Harwell (England), Health Physics and Medical Div., Rept. HL 72/4074 (C10), AERE-R 7134, 34p., Oct. 1972. 43 refs.*

The levels of about 30 trace elements were determined in airborne dust, rainwater, and dry deposition at a single rural site in northwest England during a period of nearly 2 years. Regular samples were analyzed by neutron activation followed by automatic gamma ray spectrometry, or by X-ray fluorescence. Methods of sampling, sample preparation, and analysis had adequate accuracy and precision. The basic parameters, trace element contents in air, rain, and dry deposition, can be combined to produce two additional derived parameters, washout factor (W), that related to the vertical atmospheric distribution of a trace element, and dry deposition velocity (Vg) that relates to particle size. The highest concentrations measured in air were for chlorine, sodium, calcium, aluminum, iron, lead, and zinc. There was a general increase in concentrations during the winter. A correlation was carried out of concentrations and wind direction for a limited number of elements. The amounts of the total deposition measured on the ground generally follow those of the concentrations in air: in the case of certain elements the dry deposition accounts for a significant proportion of the total. By reference to the values of Vg against W, most of the elements present in detectable quantities may be divided into three categories: maritime (Na and Cl), soil derived, and artificial or industrial. The first has large Vg and W, the second large Vg and low W, and the third low Vg and W.

60973 **APTIC NO. 47735**

Daniels, Anders, Richard H. Jones, and Wilfrid Bach

DETERMINATION OF PATTERNS OF AVERAGE AND MAXIMUM AIR POLLUTANT LEVELS IN URBAN

AREAS. Preprint, American Meteorological Society, Boston, Mass. and American Inst. of Medical Climatology, Philadelphia, Pa., p. 114-119, 1972. 6 refs. (Presented at the Conference on Urban Environment and Second Conference on Biometeorology, Philadelphia, Pa. Oct. 31-Nov. 2, 1972.)

Standard statistical diffusion models predict the concentration of pollutants to be equally distributed on both sides of a line through an emitting source parallel to a distinct mean wind direction prevailing during the prediction period. Since hourly mean winds are generally not reported in individual degrees as is required for such calculations but rather as falling into larger sectors, it is necessary to modify the diffusion expression to accommodate such standard wind statistics. The most common method is to assume that the wind blows only from the center direction of each sector, but this may lead to very large errors in the calculated concentrations in most of the downwind areas. A more realistic reproduction of the actual wind direction distribution can be obtained by fitting a continuous distribution to the histogram. Calculations are examined for circular wind direction distribution, maximum likelihood estimation, choosing the order of the model, area source determination, and frequency models for one-hour and extended periods. Advantages to the different models and inherent errors are reviewed.

60974 **APTIC NO. 81795**

Ferguson, Eldon E.

REACTION RATES OF ATMOSPHERIC CONSTITUENTS. *In: Remote Sensing of the Troposphere. National Oceanic and Atmospheric Administration, Boulder, Colo., Aeronomy Lab., Chapt. 27, p. 1-16, Aug. 15, 1972. 9 refs.*

GPO

An introduction to chemical reaction rate theory is presented along with specific examples of tropospheric chemical reactions. Categories of reactions covered include: unimolecular reactions, three-body association reactions, chain reactions and free radical mechanisms, ion-molecule reactions, and excited state reactions. Specific tropospheric reaction schemes relevant to the photochemical oxidation of nitric oxide and the oxidation of hydrocarbons to produce aldehydes and peroxyacylnitrates are described.

60975 **APTIC NO. 79817**

Fischer, William H.

ATMOSPHERIC CHEMISTRY: TRACE GASES AND PARTICULATES. *Sci. Total Environ., 1(3):314-320, Nov. 1972. 36 refs.*

The worldwide atmosphere is similar at moderate distances from pollution sources. The approximate average concentrations of sulfur compounds in uncontaminated troposphere are: hydrogen sulfide, 0.2 ppb; sulfur dioxide, 0.5 ppb; and sulfate aerosols, 2 microgram/cu m. Approximate concentrations in polluted atmospheres are: H2S, 500 ppb; and SO2, 2000 ppb. Nitrous oxide averages about 250 ppb in clean air and 1000 ppb in polluted air. Nitrogen dioxide ranges from undetectable to 1.3 ppb in unpolluted atmospheres, and up to 2000 ppb in polluted ones. Ammonia averages about 15 ppb in clean air and 2000 ppb in polluted air; ammonium aerosols average perhaps 0.1 microgram/cu m, while nitrate aerosols may range up to 0.3 microgram/cu m. Ozone ranges from 25 ppb in the tropics to 40 ppb in polar regions, and up to 1000 ppb in polluted areas. The mean temperature of the earth has been rising over the past century in a manner parallel to the mean increase in carbon dioxide content of the atmosphere. However, over the past decade or so, the rise in the mean earth temperature has been reversed. Since particulate surfaces are sites of atmospheric reactions, a reduction in their concentration may lead to an increase in the reactive gases in the free atmosphere. The interception by clouds of downward ultraviolet radiation may have a desirable effect in reducing photochemical reactions in the atmosphere.

60976 **APTIC NO. 47513**

Frenzen, Paul, R. L. Hart, and R. K. Langs

SURFACE ENERGY BUDGET MEASUREMENTS OVER LAKE MICHIGAN. *In: Radiological Physics Division Annual Report. Environmental Research. January through December 1971. Argonne National Lab., Ill., Radiological Physics Div., Rept. ANL-7860, p. 270-298, 1972. 8 refs.*

A program of micrometeorological measurements over Lake Michigan designed to examine short-period, weather-controlled variations in the exchange of heat and moisture between the open water and the air above was begun in 1970. Additional experiments conducted in 1971 obtained extended periods of continuous measurement of air and water temperature, humidity, wind speed, and net radiation, ranging in duration from several days to several weeks. These observations were combined in consecutive hourly thermal energy budgets for the lake-atmosphere system and are presented here in the form of smooth curves through the hourly averages. The observations provide an extensive body of quantitative information on the natural, vertical heat exchange over Lake Michigan, information which should be taken into account in the consideration of thermal pollution problems affecting the Great Lakes. In particular, variations of the undisturbed, natural heat exchange observed to occur in response to changing weather conditions, time of day, and season give useful insight into the thermal dynamics of cooling ponds, as well as the day-to-day energy balance of the lake observed. Further, the data suggest similar meteorologically dependent behavior on the part of the heat lost directly to the atmosphere from thermal plumes discharged in open waters. (Author introduction modified)

60977 **APTIC NO. 81792**

Hall, Freeman F., Jr.

TEMPERATURE AND WIND STRUCTURE STUDIES BY ACOUSTIC ECHO-SOUNDING. *In: Remote Sensing of the Troposphere. National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., Chapt. 18, p. 1-26, Aug. 15, 1972. 35 refs.*

GPO

The application of acoustic echo sounding to temperature and wind structure studies is discussed. Acoustic waves are scattered by temperature and velocity inhomogeneities in the atmosphere, thus serving as the basis for echo sounding measurements. In a typical acoustic echo sounder, short pulses of audible sound are collimated by an acoustic antenna and directed into the atmosphere. The returning scattered signals are collected by the same antenna for monostatic measurements of thermal structure or at a different antenna some distance removed for bistatic measurements of both wind and thermal structure. Wind produces a Doppler frequency shift in the scattered sound, allowing horizontal and vertical wind components to be measured by a frequency analysis of the signals collected by a three antenna array. (Author abstract modified)

60978 **APTIC NO. 47746**

Marcus, Allan H.

FLUCTUATIONS IN AIR POLLUTION FROM HIGHWAYS: THEORY. *Preprint, American Meteorological Society, Boston, Mass. and American Inst. of Medical Climatology, Philadelphia, Pa., p. 45-48, 1972. 17 refs. (Presented at the Conference on Urban Environment and Second Conference on Biometeorology, Philadelphia, Pa., Oct. 31-Nov. 2, 1972.)*

The theoretical basis for an accurate statistical model to define fluctuations in air pollution from highways is reviewed. The diffusion model for statistical distribution data should include differences in vehicle type; differences in individual emission rate and its dependence on speed for vehicles of a given type; differences in vehicle spacing; local mean wind; atmospheric stability; turbulence; coupling between vehicle movement, wind, and turbulence; and highway geometry and configuration as boundary effects. Equations are calculated for impact function, pollutant concentrations, Gaussian diffusion, and variability in emissions.

60979 **APTIC NO. 38220**

Monin, Andrej

RESEARCH INTO THE INTERACTION BETWEEN THE ATMOSPHERE AND THE OCEAN. *(Untersuchung der Wechselwirkung zwischen Atmosphaere und Ozean). Text in German. Meerestechnik, 3(1):21-22, Feb. 1972.*

The processes of interaction between the atmosphere and the ocean control many important geophysical phenomena. Their investigation is, therefore, one the most prominent tasks in geophysics and meteorology. The dynamic and thermal interaction between the atmosphere and the ocean is based on exchanges of heat, moisture, kinetic energy, and gaseous and solid particles above the surface of the sea. Dust particles fall from the atmosphere into the ocean and play a considerable role in marine-sediment formation. During rough sea, salt particles from the ocean enter the atmosphere in which the moisture condenses, leading to fog and cloud formation. Russian research work in this field is surveyed.

60980 **APTIC NO. 49744**

Nagata, Satoko, Kunihiko Asakuno, and Toshio Ohira

THE STUDY OF FORMALDEHYDE PHENOMENA IN HIGH OXIDANT CONCENTRATIONS. *(Konodo okishidanto shutsugenji no horumu arudehido ni tsuite). Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 69, (Nov. 7-9, Paper 17.)*

The relationships between formaldehydes and oxidant concentration and between formaldehydes and eye damage were studied. Formaldehyde measurements were taken continuously between Aug. and Sept. 1971 in central Tokyo and at a high school in the suburbs where frequent occurrences of photochemical smog were noted. An automatic sampler was used, the air sample was passed through 10 ml of pararosaniline solution and sodium thiosulfate. The average formaldehyde concentration was higher in central Tokyo than in the suburbs. Therefore, formaldehyde should not be taken singly as an index for photochemical reactions. However, when high concentrations of oxidants are formed, the degree of formaldehyde is also high during the day. There was no high correlation between formaldehyde and eye irritation; but when oxidant plots were taken, they showed a good correlation with the cases of eye damage.

60981 **APTIC NO. 43003**

O Neill, R. V., M. Reeves, and J. B. Mankin

REGIONAL ECOLOGICAL EFFECTS OF A HYPOTHETICAL POWER PLANT. *Oak Ridge National Lab., Tenn., Ecological Sciences Div., Pub. 430, Rept. ORNL-4759, UC 48, p. 133, March 1, 1972. 1 ref.*

NTIS: ORNL-4759

Sulfur dioxide concentrations in air and potential effects on plant crops resulting from the construction of a hypothetical coal-burning power plant are mapped for an area representing a hypothetical county in the southeastern United States. A Gaussian plume air diffusion model was used to predict concentrations of sulfur dioxide and fly ash as grid points across the region. Results indicated that most effects were highly localized but that damage to sensitive plants, such as alfalfa, might extend for distances of perhaps ten miles downwind.

60982 **APTIC NO. 41389**

Pearman, G. I. and J. R. Garratt

GLOBAL ASPECTS OF CARBON DIOXIDE. *Search, 3(3):67-73, March 1972. 43 refs.*

Present evidence is not sufficiently compelling to relate completely the increased atmospheric carbon dioxide content with CO2 from fossil fuel combustion, or to establish that such trends are likely to continue. This increase has been observed at only a few locations over a period of only 10 years. Twentieth century global warming was probably not due to CO2 increase alone, particularly in the light of a reversal in global temperature trends in the last two decades. With imprecise knowledge of the causes of atmospheric CO2 changes, the effect of fossil fuel combustion on atmospheric CO2 and the part played by CO2 in the global radiation balance and its effect on atmospheric circulation and climate, immediate serious attention should be given to the subject, in the context of atmospheric pollution in general. There is particular need for a mid-latitude monitoring center in the southern hemisphere for which, at present, there is no data. (Author summary modified)

60983 **APTIC NO. 67065**

Pueschel, R. F., H. T. Ellis, L. Machta, G. F. Cotton, E. C. Flowers, and J. T. Peterson

NORMAL INCIDENCE SOLAR RADIATION TRENDS ON MAUNA LOA, HAWAII. *National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Labs., Mauna Loa Observatory, Hilo, Hawaii, Environmental Protection Agency, Research Triangle Park, Div. of Meteorology, p. 164-168, 1972 (?).*

Incident solar radiation measurements at Mauna Loa, Hawaii, are presented. The transmission factors presented are fractions of the apparent extraterrestrial radiation in the Langley plots, which is approximately 10% lower than the true solar constant. The transmission factors are shown as functions of time for 1958-1971. The quantitative relationships between transmission and time for the periods from Jan. 1958 to March 1963 and from April 1963 to Dec. 1971 are shown. The record revealed a seasonal variability with a minimum of atmospheric transmission in early summer. During a period of relative volcanic quiescence between 1958 and 1963, the amplitude of this periodicity was 0.4% of the annual average transmittance level. In April 1963, the station record experienced a sharp decrease associated with the dust from the March 1963 Mt. Agung volcanic eruption. Additional volcanic eruptions subsequent to 1963 apparently delayed the recovery of atmospheric turbidity to its background levels. Since about 1969, the receipt of normal incident solar radiation at Mauna Loa has been similar to that found before 1963. There has been no detectable trend in normal incident solar radiation due to the emission of particulate matter from human activities. Higher turbidities in summer may be due to longer aerosol residence times and greater particulate load of tropical atmosphere from higher latitudes. The lower atmospheric transmissions during the summer could be the result of increased photochemical aerosol formation caused by the oxidation of volatile organic materials of plant origin. Increased atmospheric water content during the summer could yield higher turbidity values.

60984 **APTIC NO. 76463**

Reid, D. G. and R. G. Vines

A RADAR STUDY OF THE SMOKE PLUME FROM A FOREST FIRE. *Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia), Div. of Applied Chemistry, Technical Paper 2, 12p., 1972. 5 refs.*

The development of the smoke cloud from a summer wildfire in a forest area was studied on a radar screen. Photographs were also taken. Variations in the height of both the top and bottom of the smoke column were followed as it was blown downwind; estimates of the rate of rise of the smoke, at different heights, were also obtained. The general behavior of the smoke cloud is interpreted in terms of the prevailing winds, and the lapse rate in the surrounding air. (Author abstract)

60985 **APTIC NO. 42240**

Risebrough, Robert W. and Brock de Lappe

ACCUMULATION OF POLYCHLORINATED BIPHENYIS IN ECOSYSTEMS. *Environ, Health Perspect., 1972:39-45, April 1972. 35 refs.*

Chlorinated biphenyl compounds have become ubiquitous components of the global environment. Environmental input began in the U. S. in 1929. Current levels in the various sinks are a function of the total manufactured to date, pathways through the ecosystem, degradation rates, partitioning coefficients within the organic systems, and the rate of permanent deposition in sediment. The only synthetic pollutant for which a mass balance equation has been derived is DDT. Difficulties involved in writing a mass balance equation for PCB are: the lack of production figures for classes of PCB, measurements from the mixed layer of the ocean and deeper, standardization of the measurement techniques, and the suspicion that the classical food chain theories do not completely apply for PCB. The major difficulty is the lack of a basic statistical design for sampling.

60986 **APTIC NO. 52830**

Rosinski, J., C. T. Nagamoto, J. A. Young, N. A. Wogman, and R. W. Perkins

RADIONUCLIDES AS ICE-FORMING NUCLEI. *J. Rech. Atmospheriques, 6(4):693-696, Oct.-Dec. 1972. 4 refs.*

Laboratory experiments were performed in which freezing temperatures of supercooled water drops containing different radionuclides were determined. The experimental procedure and results are described. Man-made and cosmogenic radionuclides could act as freezing nuclei. Their influence on the production of ice crystals in natural clouds is at present difficult to evaluate.

60987 **APTIC NO. 80254**

Weickmann, Helmut K.

INADVERTENT WEATHER MODIFICATION. *In: Collected Reprints: 1971-1972. Atmospheric Physics and Chemistry Lab., Washington, D. C., p. 263-275, 1973. 8 refs. (Presented at the Interagency Conference on Weather Modification, 14th, Skyland, Va., Oct. 1972.)*

GPO

The effect of anthropogenic nuclei sources on inadvertent weather modification is discussed. Data are presented to illustrate that the only atmospheric layer in which large scale modifications of aerosol concentration have occurred is the lower boundary layer. Gaseous constituents in the stratosphere have, however, increased, particularly for ozone and water vapor during the last decade. Measurements of atmospheric electrical parameters above the trade wind inversion of the Pacific Ocean indicate that turbidity has not increased at this altitude from 1960 to 1968. Thus, it appears that global pollution above the lower boundary layer from anthropogenic sources is virtually non-existent. However, assuming a 10%/year increase in total power requirements, anthropogenic aerosol production is estimated to equal that of natural production within about 23 years. Such an occurrence may possibly signal the beginning of global inadvertent weather modification.

60988 **APTIC NO. 81794**

Westwater, Ed R. and Otto Neall Strand

INVERSION TECHNIQUES. *In: Remote Sensing of the Troposphere. National Oceanic and Atmospheric Administration, Boulder, Colo., Wave Propagation Lab., Chapt. 16, p. 1-13, Aug. 15, 1972. 26 refs.*

GPO

Examples of radiometric inverse problems encountered in tropospheric remote sensing are discussed, with particular emphasis on temperature profile retrievals. Topics covered include: the determination of vertical temperature profiles from satellite measurements of the upward radiance of gases like carbon dioxide or oxygen, ground-based measurements of downward emission by oxygen, and radiometric determinations of water vapor and ozone profiles. Many remote sensing problems can be reduced to a Fredholm integral equation of the first kind. Mathematical properties of this equation are discussed; and smoothing, statistical, and iterative inversion techniques are presented. Examples of temperature profile retrievals from ground-based microwave and satellite infrared radiance observations are illustrated.

60989 **APTIC NO. 82844**

Science and Technology Agency (Japan), Research Coordination Bureau

SPECIAL RESEARCH REPORTS ON PHOTOCHEMICAL SMOG PHENOMENON. *(Kokagaku sumogu gensho no kaimei ni kansuru tokubetsu kenkyu hokokusho). Text in Japanese. 212p., June 1972.*

Reports on the formation mechanism of photochemical smog and technical developments concerning measurement methods for photochemical smog from five governmental agencies are compiled. Studies on the formation mechanism include photochemical reaction experiments using smog chambers, measurement of atmospheric ultraviolet intensity using an ultraviolet spectrophotometer, and gas chromatographic analysis of lower hydrocarbons in the atmosphere. Studies on the development of photochemical smog measurement techniques include measurement of atmospheric oxidant concentrations, prototype production of small oxidant measurement devices, mist measurement methods based on reactions on a sampling surface, chemical analysis of atmospheric sulfuric acid or H2SO4 mist, and prototype production of continuous measurement devices for atmospheric H2SO4 mist.

60990 **APTIC NO. 84111**

Chiba Prefectural Environmental Pollution Research Inst.

METEOROLOGICAL ANALYSIS OF HIGH SULPHUR OXIDES CONCENTRATIONS IN CHIBA CITY. *(Chibashi iosankabutsu konodo kisho kaiseki). Text in Japanese. Chiba-ken Kogai Kenkyusho Nenpo (Annu. Rep. Chiba Pref. Res. Inst. Environ. Pollut.), no. 4:22-27, 1972.*

A meteorological analysis of sulfur oxides concentrations in Chiba Prefecture is reported. From July 5 to July 9 in 1972 high SOx concentrations in Chiba city were investigated. The SSW to SW range of wind direction and a high velocity of wind caused high SOx concentrations. An investigation in Shiroyado in the Sodegaura area which is next to the Keiyo Industrial Belt found that a NW to NNW range of wind direction led to high SOx concentrations. In the Hanto area of Kisarazu city, leaves of rice plants were found damaged, which was explained by the presence of a strong SSW to SW wind (over 7m/s) together with a high concentration of SOx. Concentrations of SOx over 30 ppm were monitored in the Kaneda Elementary School area of Kisarazu city, and were explained by gentle north winds bringing low concentrations of SOx and violent south winds bringing high concentrations of SOx.

60991 **APTIC NO. 84112**

Chiba Prefectural Environmental Pollution Research Inst.

AIR POLLUTION MONITORING ACTIVITIES. *(Taikiosen kanshi jigyo). Text in Japanese. Chiba-ken Kogai Kenkyusho Nenpo (Annu. Rep. Chiba Prefect. Res. Inst. Environ. Pollut.), no. 4:13-19, 1972.*

The activity of air pollution monitoring stations is reported, including daily measurements of sulfur oxides using a telemetry system, and an investigation of sulfur oxides and suspended particulates in relation to seasonal surface wind directions. From April 1972 to March 1973, only one SOx warning was officially announced in the Ichihara/Sodegaura area, and there were 65 days when the preparatory SOX monitoring system was used. High concentrations of SOx occurred most often in autumn and winter, and with a mild wind velocity. All the monitoring points which failed to meet SOx concentrations coincided primarily with a SSW-WNW wind direction, frequently found from spring to summer. The suspended particulates showed high concentrations in autumn with mild wind velocities.

1971

60992 **APTIC NO. 41322**

Balla, Alajos

DATA FOR THE NITROGEN CONTENT OF RAINWATER IN HUNGARY. *(Nehany adat a magyarorszagi csapadekvizek nitrogen tartalmahoz). Text in Hungarian. Agrokem. Talajtan, 20(3):323-328, June 1971. 21 refs.*

The nitrogen content of rainwater was studied for 2 years in water samples from six experimental stations of the Research Institute of Soil Science and Agricultural Chemistry of the Hungarian Academy of Sciences in Budapest. The data obtained indicate that the amount of nitrogen which has been deposited into the soil annually by rain is 10-20 kg/ha for agricultural areas, 30 kg/ha for surroundings of big cities, and 60 kg/ha for areas near industrial centers. Tabular data indicating the number of sampling places, locations, nitrogen content of rainwater, and annual amounts of rainwater are presented.

60993 **APTIC NO. 35903**

Brock, J. R.

ON SIZE DISTRIBUTIONS OF ATMOSPHERIC AEROSOLS. *Atmos. Environ., 5(10):833-841, Oct. 1971. 13 refs.*

The question of the existence of asymptotic power laws (Pareto distributions) for atmospheric aerosols was investigated. Present evidence that continental aerosols are asymptotically Paretian is not convincing; improved tests for such a hypothesis are suggested. An anlytical formulation of a model for the atmospheric aerosol, based on condensational growth for particles greater than a certain size, yielded characteristic aerosol number densities whose forms were determined by the particular growth law for condensation. The growth process coupled to a reservoir of particles at the truncation point of the density, supplied by condensation, mucleation, and coagulation, caused the aerosol to forget its initial distribution and to approach with time the characteristic densities. When condensational growth proportional to particle mass was assumed, an exact Paretian density was obtained whose exponent was determined by the ratio of particle removal to growth rates. Characteristic densities arising from other condensational growth law are summarized. (Author abstract modified)

60994 **APTIC NO. 83403**

Chassany, J.

VARIATIONS OF OZONE CONTENT IN THE AIR AT GROUND LEVEL. *(Variation de la teneur en ozone de l air au niveau du sol). Text in French. Meteorologie, no. 82:99-101, April-June 1971.*

Ozone was measured by continuous amperometry (0.02 microgram/cu m threshold) for 227 days. An increase in ozone content was considered significant when the ozone rose at least 30% in a maximum of 3 days. The days were subdivided into 4 periods of 31 days corresponding to day J, maximum increase of ozone content, and to the preceding days, J1, J2, and J3, and into a fifth period comprising the 103 remaining days. Results indicate that frequencies of tropopause variations were significantly higher during J3 (0.45), J2 (0.485), and J1 (0.45) than the 103 day period (0.31). A comparison of frequencies confirms the existence of a link between the altitude variations of the tropopause and the increases in radioactivity during the subsequent 1-3 days.

60995 **APTIC NO. 42447**

Chu, Roland T.

NUMERICAL PREDICTION OF ROCKET ENGINE EXHAUST CLOUD RISE AND GROWTH. *Preprint, American Meteorological Society, Boston, Mass., 20p., 1971. (Presented at the American Meteorological Society, Meeting, 51st, San Francisco, Calif., Jan. 11-14, 1971.)*

Numerical prediction of rise and growth of exhaust clouds formed upon the static firing of a rocket engine or space vehicle is considered. A physical-numerical model was developed for predicting the rise and growth of exhaust cloud following a theory of the bent-over plume of heated gas from a continuous source. In addition to the maximum height of cloud rise, the model predicts other pertinent parameters such as instantaneous height, rise rate, and temperature excess of the cloud. Environmental factors such as wind speed and thermal stability are also taken into account. Model computations were carried out for 12 static engine tests for which observation data of exhaust cloud rise and growth were available.

60996 **APTIC NO. 40615**

Clarke, John F. and James T. Peterson

AN EMPIRICAL MODEL USING EIGENVECTORS TO CALCULATE THE TEMPORAL AND SPATIAL VARIATIONS OF THE ST. LOUIS HEAT ISLAND. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Meteorology, 39p., 1971 (?). 21 refs.*

Eigenvectors, or empirical orthogonal functions, were used to study the relationship between the St. Louis heat island and land use and meteorological parameters. The data used in this study consisted of observations of nocturnal surface air temperature over St. Louis on 17 occasions during the winter, spring, and summer of 1952-53. The spatial distribution of the heat island was primarily a function of land use, but meteorological variables, especially wind direction, also influenced the heat island patterns. The magnitude of the heat island had a significant positive correlation with the vertical temperature gradient outside the city. An empirical model is developed for St. Louis to study the heat island that would result from hypothetical land-use patterns and meteorological conditions. Examples are presented for two such land-use distributions. (Author abstract modified)

60997 **APTIC NO. 81941**

Davydov, Y. N., I. L. Karol, Y. V. Krasnopevtsev, N. M. Lukoyanova, S. G. Malakhov, and M. A. Petrosyants

RESEARCH ON TROPOSPHERIC TRANSFER ABOVE THE TROPICAL ATLANTIC WITH THE AID OF RADIOACTIVE TRACERS. *In: Pervyy Vsesoyuznogo Simpoziuma po Pigap, p. 92-104, 1971. 10 refs. Translated from Russian. Air Force Systems Command, Washington, D. C., Foreign Technology Div., Rept. FTD-MT-24-2173-74, 14p., Nov. 25, 1974.*

NTIS; DDS: AD/A-004 530

The Atlantic Tropical Experiment (ATEP) is concerned with the dynamics of the tropical zone of convergence (VZK), its interactions with large scale tropical disturbances, and its connection with tropical cloud structures. There is special interest in the analysis of ship measurements of air radioactivity in the eastern part of the tropical Atlantic, the region of mesoscale polygon location. The results of measurement of the natural and artificial radioactivity of the lower layer of the atmosphere from 30 deg north latitude to 30 deg south latitude in this region between 1965 and 1970 are given, along with their analysis and comparison with the results of analogous measurements and synoptical conditions for this zone. The atmospheric content of nuclear explosion products (p.ya.v.) in the Northern Hemisphere was higher than the Southern until 1968, affected by precipitation of the products of the powerful 1961 and 1972 test series. High levels of artificial beta activity in the Southern Hemisphere in late 1968 were caused by the products of test series during July to September 1968 on Mururoa Atoll, 23 deg south latitude. The p.ya.v. concentration, especially in the Northern Hemisphere, has a maximum in the spring or early summer and minimum in the autumn. Measurements of short lived decay products of radon and trace element content of airborne dust make possible determination of the continental or maritime origin of an air mass. Recommendations regarding the use of such radioactivity measurements for the solution of some ATEP problems are indicated.

60998 **APTIC NO. 33615**

Faraponova, G. P.

THE VERTICAL STRUCTURE OF THE ATMOSPHERIC TRANSPARENCY. *(O vertical noy strukture prozrachnosti atmosfery). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. atmosfery i okeana, 7(1):81-84, 1971. 8 refs.*

The relationship between the variations of radiation fields and the variations of optical and meteorological parameters was studied by means of the ratios between the statistical characteristics of these fields. In order to obtain the statistical functions of the vertical structure of short-wave radiation currents, measurements performed within various years were used. Forty profiles of descendent short-wave radiation currents obtained under conditions of cloudless atmosphere were selected. The data were then used to compute the autocorrelation matrix reflecting the relation between the variations of the descendent short-wave radiation currents at different levels. A high correlation between these variations was obtained for levels ranging from 0.07 to 5 km. The correlation between variations observed at higher levels appeared to be poorer than that found between the variations observed in layers located above the 1.0-1.5 km altitude. This may be attributed to absorption phenomena within the near infrared region of the spectrum produced by water vapor.

60999 **APTIC NO. 42977**

Finkelstein, Peter

VERIFICATION OF AIR POLLUTION POTENTIAL FORECASTS. *Preprint, American Meteorology Society, Boston, Mass. and Air Pollution Control Assoc., Pittsburgh, Pa., 4p., 1971. 7 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-9, 1971.)*

The parameters used in the Philadelphia air pollution potential forecast include wind speed and direction, mixing height, and precipitation. That these parameters influence the dispersive capacity of the atmosphere was verified by a 30-day comparison of pollution potential forecast values and actual values measured the next morning. The chi squared value for the comparison was 79, which enabled rejection of the null hypothesis of no skill with over 99% certainty. The chi squared test was also used to compare measured pollution vs. the pollution potential measured the same morning and to compare forecast pollution potential with measured pollution. The respective chi squared values of 32 and 20 again showed significant forecast skill. The errors tended to be in the direction of high forecasts. This implies that the chances of a severe air pollution incident occurring without prior warning are small.

61000 **APTIC NO. 40893**

Funabashi, Motohashi, Koichi Haruna, and Masamichi Ozaki

A SIMULATION MODEL FOR CONCENTRATION OF AIR POLLUTION BY MULTIPLE SOURCES IN A LARGE AREA. *(Takaishutsugen ni yoru koiki osen no shimyureshon moderu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 6(11):136, 1971. 3 refs. (Presented a the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27-29, 1971.)*

A new model for the forecast and control of air pollution from multiple sources in a large area is examined. The resolution ability of the model spatially was 1-2 km and was timed at one hour. The input included the distributions of wind and pollutant concentrations; the output was on-earth concentration distribution. Utilization of the system required the ability to record the diffusion-transportation phenomena of an uncertain field; on-line calculation; elimination of the error generated from model calculation by using the observed data. The calculation of concentration was then divided into diffusion-transportation and transporatation based on the shape of distribution, and the actual concentration distribution was expressed by the sum of the two.

61001 **APTIC NO. 43059**

Gray, Carlton, Harvey L. Malchow, Dennis C. Merritt, and Robert E. Var

AEROSOL MONITORING BY SATELLITE HORIZON SCANNING. *Preprint, American Chemical Society, Washington, D. C. American Institute of Aeronautics and Astronautics, New York, Environmental Protection Agency, Washington, D. C., Institute of Electrical and Electronic Engineers, New York, Instrument Society of America, New York, National Aeronautics and Space Administration, Washington, D. C., and National Oceanographic and Atmospheric Administration, Washington, D. C., 7p., 1971. 11 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, AIAA Paper 71-1111.)*

A newly adapted horizon-scanning technique can simultaneously monitor the vertical distribution of aerosols, as well as ozone and neutral atmospheric density, in the stratosphere and mesosphere for both meteorologic and ecologic application in a global satellite-monitoring program. The technique provides for the inversion of horizon-intensity profiles obtained by scanning the earth's sunlit horizon with a satellite-borne sensor. The sensor mechanically scans the earth horizon in a multi-spectral mode, allowing the aerosols to be distinguished from other atmospheric constituents. The sensor output is inverted by applying a Kalman-Bucy recursive filter to the received signal, using a reference-intensity profile generated by a theoretical radiative- transfer simulation. When the scattering or absorption cross sections are well known, as in the case of ozone and the neutral atmosphere, the received multispectral signals are inverted to yield constituent-density information. When the cross sections are not well known, as in the case of aerosols, the extinction profile is obtained directly from the inversion. The received signal is not encumbered by noise and attenuation produced by the lower atmosphere, and the altitude of an aerosol layer can be precisely located by means of satellite ephemeris and altitude control. Results are given based on real and simulated experimental data.

61002 **APTIC NO. 42505**

Grenda, R. N., M. H. Bortner, P. J. LeBel, J. H. Davies, and R. Dick

CARBON MONOXIDE POLLUTION EXPERIMENT - (I). A SOLUTION TO THE CARBON MONOXIDE SINK ANOMALY. *Preprint, American Chemical Society, Washington, D. C.; American Institute of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Institute of Electrical and Electronic Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; National Oceanographic and Atmospheric Administration, Washington, D. C., 16p., 1971. 17 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1120.)*

Atmospheric carbon monoxide has been designated as a serious possible health hazard in urban areas. In addition, a potential global problem exists. The sources of CO are such that one would expect the global average concentration to double every 3 or 4 years. This is apparently not happening, implying that there is some sink mechanism for destroying the CO as rapidly as it is being produced. The carbon monoxide pollution experiment (COPE) involves the development of both the experiment concept and the remote sensor required to measure atmospheric CO with sufficient accuracy to locate the CO sink. The instrumentation which is being developed for use in the remote CO measurements is the correlation interferometer. Scanning systems and signal processing are discussed. (Author abstract modified)

61003 **APTIC NO. 82766**

Johnston, Harold Sledge

CATALYTIC REDUCTION OF STRATOSPHERIC OZONE. *California Univ., Berkeley, Dept. of Chemistry, Int. Conf. Environ. Future Proc., 1st, Finland, 1971, p. 175-177. 2 refs. (June 27-July 3.)*

Photochemical reactions involved in the catalytic reduction of stratospheric ozone are reviewed. Nitric oxide and nitrogen dioxide as well as hydroxyl and hydroperoxyl radicals act as catalytic couples for the destruction of ozone. The catalysts are not consumed in the process, and one molecule of nitrogen oxide can destroy a large number of ozone molecules. If the amount of NO_2 is 0.1% of that of ozone, the rate of ozone destruction in the stratosphere by NO_2 catalysis is 4.6 times faster than the rate of ozone destruction in the natural oxygen system, and the steady-state ozone concentration is reduced by a factor of 2.3. With an increase or decrease of NO_2 about this reference point (0.1% ozone), the reduction of ozone varies relatively slowly and very nearly as the square root of the NO_2 concentration. For projected fleets of supersonic aircraft, a large portion of the lower stratosphere is expected to be loaded with NO_x in amounts as great as 0.1% of the present ozone concentration, and large reductions in ozone are expected.

61004 **APTIC NO. 43057**

Kaimal, J. C., J. C. Wyngaard, Y. Izumi, and O. R. Cote

BEHAVIOR OF SPECTRA AND COSPECTRA OF TURBULENCE IN THE ATMOSPHERIC SURFACE LAYER. *Preprint, American Meteorological Society, Boston, Mass., and Air Pollution Control Assoc., Pittsburgh, Pa., p. 22- 29, 1971. 16 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-9, 1971.)*

The results of spectral and cospectral analyses of data obtained from a field experiment conducted in 1968 over a flat site in southwestern Kansas are described. The instrumentation consisted of three-component sonic anemometers, hot-wire anemometers, and fine platinum wire thermometers at three levels on a 32-meter tower. Surface stress measurements were obtained from two CSIRO drag plates installed about 50 m from the tower. Mean wind speed and temperature gradients were measured with standard cup anemometers and resistance thermometers at 10 levels between 0.5 and 32 m on the tower. Outputs from these sensors were sampled, digitized, and stored on magnetic tape by means of a computer- controlled data acquisition system. Anolog signals from the sonic and hot-wire anemometers, fine platinum wire thermometers, and the drag plates were sampled 20 times/sec, while the slower responding cup anemometers and resistance thermometers were sampled once/sec. The hot-wire anemometer outputs were also differentiated, low-pass filtered, and recorded on a FM tape recorder. Equations are given for the different spectra and cospectra observed. Interpolation formulas are given for the neutral spectra of velocity components, stress, and heat flux.

61005 **APTIC NO. 43048**

Lamb, Robert Goodman

NUMERICAL MODELING OF URBAN AIR POLLUTION. *California Univ., Los Angeles, Dept of Meteorology, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 289p. 33 refs.*

A systematic method is proposed for representing atmospheric motions in diffusion model calculations. The consequences of this method on the diffusion phenomenon are investigated. Formula are derived for computing the stochastic moments and probability distribution of the concentrations of marked particles in a turbulent flow. For the case where the motions of the marked particles are statistically independent, the formulas for the mean square concentration are compared with empirical data revealing excellent agreement. A simple two particle model, embodies all of the information required to compute both the mean and mean square concentration of certain many particle problems, predicts a relationship between the ensemble mean concentration and space-time averages of any realization of the concentrations. A generalized model, giving the mean concentrations in terms of the Lagrangian statistics of the particle motions, shows how a fluid simulation model can be used to compute the particle statistics required to apply the Lagrangian model to general problems. For homogeneous, stationary turbulence, the generalized Lagrangian model reduces to the well known Gaussian puff and plume formulas. A discrete time- continuous space model, reduced from the Lagrangian model under conditions of local homogeneity and local stationary turbulence, is reduced to the classical diffusion equation in the limit of large space and time scales in problems where the independent parameters are sufficiently slowly varying in space and time. The application of Lagrangian diffusion models to problems involving nonlinear chemical reactions, such as photochemical smog, is considered with the development of a specific perturbation technique for this application. The functional differential equation is derived which governs the joint characteristic functional of the particle concentrations and Eulerian fluid velocities for the general problem of chemically reactive substances. (Author abstract modified)

61006 **APTIC NO. 41382**

Makhon ko, E. P. and V. M. Drozdova

THE CONTENT OF MICROELEMENTS IN ATMOSPHERIC PRECIPITATIONS. *(O soderzhanii mikroelementov v atmosfernykh osadkakh). Text in Russian. Tr. Inst. Eksp. Meteorol., no. 14:81-85, 1971. 12 refs.*

An improved spectral analytic method was used to determine the manganese, lead, nickel, and iron contents of precipitation sample volumes of 100 ml for the northern, north-west, and central areas of European USSR territory. The samples were treated with hydrochloric acid prior to evaporation and were analyzed in a quartz spectrograph. Analyses of 75 samples showed highest monthly nickel, lead, and iron concentrations for the northwestern territories, while the manganese concentrations were highest in the central areas. Increased concentrations from north to south were observed. The manganese nickel, and lead concentrations in the northern and central areas tended to increase in the summer, while the iron concentrations were highest in the winter in the same areas. The manganese concentrations in the northwestern territories reached a maximum in the summer, while the nickel, lead, and iron concentrations were highest in the winter, The total mineral content ranged from 5 to 50 mg/l, and the yearly averages were 10-30 mg/l.

61007 **APTIC NO. 39438**

McElroy, James L.

A NUMERICAL MODEL OF THE NOCTURNAL URBAN BOUNDARY LAYER. *Preprint, Office of Air Programs, Research Triangle Park, N. C., Div. of Meteorology, 8p., 1971. 15 refs.*

A nocturnal urban boundary layer model was used to simulate the thermal structure of the layer over Columbus, Ohio. Experimental data included vertical profiles of temperature and moisture and ground level temperature measurements. Information on the aerodynamic surface roughness, surface relative humidity, artificial heat flux, and sub-surface thermal properties was specified at horizontal distance intervals of 1 km. Numerical simulations were made for the near steady-state period just before sunrise, with data extending to 300-400 m above ground. A constant value of 15 m was used for the layer thickness. During experiments, the depth of the layer seldom exceeded 100 m. Numerical simulations and actual data were then compared. The observed and simulated depths were in good agreement. The model may be used to estimate the effects of alternate land-use strategies on the nocturnal urban thermal structure and thus on the relative atmospheric dispersive ability.

61008 **APTIC NO. 42700**

Pitts, J. N., Jr.

THE PHOTOCHEMISTRY OF URBAN ATMOSPHERES. *Preprint, California Univ., Riverside, Statewide Air Pollution Research Center, 10p., 1971. Preprint, Louisiana State Univ., Baton Rouge, 10p., 1971. (Presented at Louisiana State University, Air Pollution, Annual Meeting, 24th, Baton Rouge, La., 1971.)*

Photochemical smog is a rapidly growing problem in urban areas around the world. Key primary pollutants including hydrocarbons and oxides of nitrogen emitted into the atmosphere undergo complex homogeneous and heterogeneous reactions initiated by solar radiation. This leads to a highly oxidizing mixture of secondary pollutants, including many compounds of chemical and biologic interest such as ozone and peroxyacetyl nitrate. Several aspects of this problem which are considered include: the nature and sources of other primary pollutants, including lead, oxygenated hydrocarbons, and polynuclear aromatic hydrocarbons; current knowledge of mechanisms for the formation of secondary pollutants such as ozone, peroxyacetyl nitrate, oxygen atoms, and singlet molecular oxygen; and scientific, medical, and legislative complications arising from efforts to control man s urban environment. Effects of photochemical smog on plants and human health are mentioned, as well as the California air quality standard for photochemical oxidant. (Author abstract modified)

61009 **APTIC NO. 79273**

Radulescu, N. D.

THE DETERMINATION OF CONDENSATION NUCLEI IN SEVERAL TOWNS WITH VARIOUS ATMOSPHERIC POLLUTION DEGREES. *Centro di Richerche di Bioclimatologia Medica dell Universita di Milano, Milan (Italy), Lacustrine Climatol. Intern. Congr. Proc., Como, Italy, 1971, p. 470-473. (May 20-23.)*

The behavior of condensation nuclei was studied in 14 towns with various degrees of atmospheric pollution in order to estimate the possibility of using these determinations as an indicator of the intensity of atmospheric pollution. The condensation nuclei also constitute an important factor acting on organisms either directly (through the respiratory tract the organism can retain 20 to 90% of condensation nuclei) or by their ability to concentrate certain toxic substances in polluted air. Determinations were made at four to eight points for each town between 11 am and 3 pm. The sampling points were chosen so that the intense traffic zones did not directly affect the determinations. The results were processed statistically. A condensation nuclei indicator was introduced for each town by calculating the interareal average for the town. A differentiated condensation nuclei charge existed both within the towns and between the towns. The condensation nuclei indicator faithfully indicates the overall atmospheric pollution in the towns studied. Therefore it can become an important information source, allowing division of aerial basins of the town into zones. The correspondence between the condensation nuclei concentration and atmospheric pollution intensity is used to propose an estimation scale for atmospheric pollution. (Author abstract modified)

61010 **APTIC NO. 41323**

Ruppersberg, G. H., H. vonRedwitz, and R. Schellhase

ATMOSPHERIC LIGHT TRANSMISSIVITY AND SCATTERING IN THE VISIBLE MICROMETERS. *(Atmosphaerische Lichtdurchlaessigkeit und Streuung im sichtbaren Spektralbereich und in den Fenstern des IR-Bereiches bis zu 5/um). Text in German. Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Oberpfaffenhofen (West Germany), Inst. fuer Physik der Atmosphaere, 89p., March 15, 1971. 91 refs.*

NTIS: N72-15372

An outline on atmospheric transmissivity and on atmospheric scattering of light, excepting the region of the absorption bands, is presented. In particular, some relations between optical and physico-chemical properties of the atmosphere are discussed. Measurements were made with an AEG-Scattered-Light-Recorder in the visible and the near infrared region up to very large standard visual ranges. A Multiple-Infrared-Scattered-Light-Recorder (MIRST) was developed, which measures visibility simultaneously on three different wavelengths up to 3.55 micrometers. The instrument is currently being tested.

61011 **APTIC NO. 40817**

Sakuraba, S., M. Moriguchi, I. Yamazi, and J. Sato

ELEVATED-SOURCE DIFFUSION IN THE SEA-BREEZE LAYER UNDER THE INLAND MODIFICATION. *(Rikujo hehensitsu suru kaifu no naka de no koengen kakusan). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution). 6(1):134, 1971. (Presented at the National Council Meeting of Air Pollution Studies, 12th, Nagoya, Japan, Oct. 27- 29, 1971.)*

Line sources of FP tracer, 12 km long, 250 and 100 m high, were dispersed at 300 g/min by helicopter over a seaside area of Hyogo prefecture to study diffusion in the sea breeze layer under inland modifications. Twenty-two collection stations were set up, mostly in the plain area. Vertical diffusion of temperature and concentration was measured at four ground points, with the furthest at 5.5 cm from the line source. Observations of both line sources at 250 m and 100 m in altitude were simultaneous. For the 100 m high line source, diffusion occurred in the neutral layer and the change of downwind distance was not clear. The 250 m line source was caught in the neutral layer, and Pasquill stability increased gradually. Since it was 160 m above sea level at 2.8 km from the seashore, the line source of 100 m had a significant topographical increase.

61012 **APTIC NO. 43071**

Shettle, E. P. and J. A. Weinman

THE TRANSFER OF NEAR ULTRAVIOLET IRRADIANCES THROUGH SMOG OVER LOS ANGELES. *Preprint, American Meteorological Society, Boston, Mass. and Air Pollution Control Assoc., Pittsburgh, Pa., p. 121-125, 1971. 7 refs. (Presented at the Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-9, 1971.)*

A model is discussed which provides the irradiances that would be expected within a photochemical smog provided that the composition of the smog is given. Alternately, given a set of measurements of the irradiances within a smog, the model yields some information about the composition of the smog. The Eddington approximation employed requires three quantities as input to characterize each layer: an optical thickness of the layer, an albedo for single scattering, and an asymmetry parameter. Three additional quantities are needed to specify the problem, namely, the surface albedo, the cosine of the solar zenith angle, and the brightness of the incident solar irradiance. Once these quantities are known it is possible to compute the irradiances as a function of depth in the atmosphere. The optimization is carried out by fitting the calculated irradiances to the radiometric measurements made during several time periods. These optimized values are used to calculate the irradiances as a function of height in the atmosphere for the different time periods. The Eddington approximation further permits inversion of the radiation measurements to infer the composition of the smog. Computed irradiances were in good agreement with irradiances observed within Los Angeles smogs.

61013 **APTIC NO. 42504**

Uthe, Edward E.

LIDAR OBSERVATIONS OF PARTICULATE DISTRIBUTIONS OVER EXTENDED AREAS. *Preprint, American Chemical Society, Washington, D. C.; American Institute of Aeronautics and Astronautics, New York; Environmental Protection Agency, Washington, D. C.; Institute of*

Electrical and Electronic Engineers, New York; Instrument Society of America, New York; National Aeronautics and Space Administration, Washington, D. C.; National Oceanographic and Atmospheric Administration, Washington, D. C., 5p., 1971. 5 refs. (Presented at the Joint Conference on Sensing of Environmental Pollutants, Palo Alto, Calif., Nov. 8-10, 1971, Paper 71-1055.)

Lidar (laser radar) can provide continuous aerosol surveillance over large atmospheric volumes. Although there are limits to the extent that quantitative information on particulate content can be derived, the distribution of the aerosol can readily be interpreted to show atmospheric features and processes important to air quality assessment. Lidar investigations of haze layer structure in urban environments and scattering layers associated with the sub-cloud layer, the trade-wind inversion, and the Sahara dust stream in the Caribbean area are described. (Author abstract modified)

61014 **APTIC NO. 72741**

Whaley, H., L. Shenfeld, G. K. Lee, M. S. Hirt, and S. G. Djurfors

THE DISPERSION OF MULTIPLE PLUMES FROM A LARGE THERMAL GENERATING STATION. *Dept. of Energy, Mines and Resources, Ottawa (Canada), Mines Branch, World Energy Conf., 8th, Bucharest, Romania, 1971, p. 1-17, 1972. 7 refs. (June 28-July 2, Paper 2.3-85.)*

The dispersion of multiple plumes from four stacks (150 m high) of a large thermal generating station was studied using instrumented helicopters, radiosondes, and pilot balloons for measurements of sulfur dioxide concentration and meteorological variables. It was possible to relate plume characteristics to meteorological conditions prevailing during the flight period by using various traversing techniques in conjunction with concurrent meteorological and ground-level measurements. Measurements during inversion breakup and during neutral conditions with similar source emissions and wind speeds revealed higher ground-level SO2 concentrations during inversion breakup. The standard deviations of the plume spread obtained from measured SO2 data were in reasonable agreement with Pasquill-Gifford values. (Author conclusions modified)

61015 **APTIC NO. 41383**

Yegorov, V. V., T. N. Zhigalovskaya, S. G. Malakhov, and A. I. Shilina

MICROELEMENT LEVELS IN THE GROUND ATMOSPHERE ABOVE THE CONTINENT AND OCEAN. *(Soderzhaniye mikroelementov v prizemnom sloye vozdukha nad kontinentom i okeanom). Text in Russian. Tr. Inst. Eksp. Meteorol., no. 14:73-81, 1971. 3 refs.*

Microelement levels of iron, aluminum, copper, lead, manganese, chromium, nickel, cadmium, and tin in the lower atmospheric layer above the territory of the USSR and the Atlantic and Indian Oceans were determined. The highest microelement concentrations were measured above continental parts of the USSR, with lower levels above coastal regions and the lowest concentrations above the polar regions of the country. Microelement levels above the oceans were by one order of magnitude or more higher in the northern than in the southern hemisphere, while iron, manganese, nickel, cadmium, and tin concentrations above the ocean in the southern hemisphere and the polar regions of the USSR were comparable. The ratio of the microelement concentrations to the corresponding dust concentrations, a significant measure of the polluting action of human activity, were about the same for the southern coastal USSR territory and northern regions. The ratio was lowest above the ocean in the southern hemisphere, while values higher by one order of magnitude were recorded above continental territories. The microelement-to-dust-concentration ratio was nearly constant during the year, while the total microelement concentration varied by about two orders of magnitude. Decreased microelement levels during the summer were recorded in many continental, particularly European, territories, which was probably due to intensified vertical turbulence and precipitation. The atmospheric lead concentrations in the western hemisphere reached a maximum in the winter at 0.005-3 micrograms/cu m.

61016 **APTIC NO. 43017**

RAINFALL AND OTHER SOURCES. *In: Environmental Impact of Highway Deicing. Edison Water Quality Lab., N. J., Storm and Combined Sewer Overflows Section, p. 45-46, June 1971. 7 refs.*

GPO

The amount of impurities and the mineral quality or rainwater, particularly chloride content, is reviewed. Rain samples at Cincinnati, Ohio had a pH of 4.8; 13.0 mg/l total suspended solids; a chemical oxygen demand of 16.0 mg/l; 1.3 mg/l total nitrogen; 0.7 mg/l inorganic nitrogen; 0.24 mg/l hydrolyzable phosphates; and 0.28 mg/l organic chlorine (mostly reflecting chlorinated hydrocarbons). The oceans are a major source of chlorides in rainwater. Calcium content of rainfall is the highest for storms over the southwest and is principally derived from dust storms. The rainfall at Cirencester, England contained an average chloride content of 3.2 mg/l over a 26 year period. At Mount Vernon, Iowa, the average level of chloride in rainwater was 10.6 mg/l from October 1913 to June 1914, and 7.1 mg/l from October 1914 to June 1915. An inventory of the chloride content of various waters, including rainwater, upland surface water, spring water, deep well water, drinking water, weak, medium, and strong sewage, urine, and sea water, is presented. Besides the chlorides universally present in rainfall, other sources of chlorides include the leaching of salt from underlying rocks and soils, salt contribution by domestic, commerical and industrial wastewaters, salinity present in irrigation return flows particularly in the western states, and air pollution fallout from industrial stacks, automotive emissions, and open dumps.

1970

61017 **APTIC NO. 82709**

Akhmedzhanov, K. A. and N. F. Gel mgol ts

CLIMATIC FEATURES OF ALMA-ATA AND THEIR ROLE IN THE FORMATION OF THE POLLUTED AIR OVER THE CITY S BASIN. *(Osobennosti klimaticheskikh usloviy g. Alma-Aty i ikh rol v zagryazneniy vozdushnogo basseyna goroda). Text in Russian. Tr. Alma-Ata, Kazakhstan. Nauchno-Issled. Gidrometeorol. Inst., no. 36:127-134, 1970. 4 refs.*

The unique temperature and wind features of the Alma-Ata region are discussed. The winds in the area are among the weakest in the Soviet Union, and the dynamics of the streamline flow of the mountainous system are quite unusual. With the general lack of motion of the atmosphere and the abundance of clean, sunny days, a local mountain-valley circulation appears which often exhausts the air streams of the area. A driving force is generated by the variety in temperatures of the mountain slope and the contiguous atmospheric body. The uniqueness of the climatic conditions of Alma-Ata significantly complicates the battle waged here against pollution. The concentration of harmful substances in the territory of the city is being investigated by the Alma-Ata Hydrometeorological Observatory, and means of taking into account the various meteorological factors in the problem of atmospheric cleaning are being examined.

61018 **APTIC NO. 23588**

Baker, Mike

PLANS FOR GLOBAL ATOMOSPHERIC RESEARCH. *New Scientist, 47(712):226-228, July 30, 1970.*

The International Council of Scientific Unions and the World Meteorological Organization have joined to sponsor a Global Atmospheric Research Program for the study of physical processes in the troposphere and stratosphere and of the factors determining the statistical properties of the general circulation of the atmosphere. Research into the physical processes could lead to increased accuracy in weather forecasting and research into the statistical properties of circulation, to a better understanding of the physical basis of climate. The first experiment planned for the program will take place in the tropics in the period 1973-1974. It will measure tropical disturbances on four characteristic scales: the large-wave scale (characteristic size of the order of 2000-10,000 km); the scale of cloud-dusters (characteristic size of the order of 100-1000 km); the meso- convective scale (characteristic size of the order of 10-100 km); and the scale of convective cells (characteristic size of the order of 1-10 km). The experiment will rely on a satellite-borne infrared sounder, a near-polar orbiting satellite, regional networks of upper air stations, a geostationary satellite, and at least 15 ships equipped for meteorological and oceanographic observations. The program may provide information relevant to the modification, or even control, of climate.

61019 APTIC NO. 42784

Briggs, Gary A.

SOME RECENT ANALYSES OF PLUME RISE OBSERVATION. *International Union of Air Pollution Prevention Associations, Proc. Int. Clean Air Congr., 2nd, Washington, D. C., 1970, p. 1029-1032. 20 refs. (Dec. 6-11, Paper ME 8E.)*

Good estimates of plume rise are required to predict the dispersion of continuous gaseous emissions having large buoyancy or a high efflux velocity. The rise of such emissions above their source height often accounts for a considerable reduction of the concentrations experienced at ground level. Direct analysis of plume rise observations and several comparisons of observations with a number of empirical and theoretical formulas have shown that very satisfactory predictions of plume rise are given by a rather spare physical-mathematical model. Basic assumptions of this model are given.

61020 APTIC NO. 43069

Chow, Tsaihwa J.

ENVIRONMENTAL POLLUTION FROM INDUSTRIAL LEAD. *Preprint, 31p., 1970. 45 refs. (Presented at the International Symposium on Biogeochemistry and Hydrogeochemistry, Tokyo, Japan, Sept. 1970.)*

The introduction of industrial lead pollutants has greatly affected the geochemical balance of lead in air, in water, on land, and in vegetation. Leaded gasoline has been isotopically identified as the overwhelming contributor of lead pollutants to the environment. Some 55 million pounds of lead are burned as antiknock additives in gasoline in the United States annually. Geographically there is a logarithmic increase of atmospheric lead concentration from the midocean, to remote high mountains, to seashore, to suburban, and urban environments. An increasing trend of lead content in the San Diego air is observed. Coarser fractions of industrial lead settle along the roadside where they are responsible for the high lead concentrations in soil and vegetation. Fine lead aerosols have been shown to travel long distances and are washed out of the atmosphere in rain and snow. The average lead concentration of rainwater for a U. S. nationwide sampling network is 36 micrograms/l. It has been calculated that industrial lead is being added to the oceans at 10 times the rate of introduction by natural weathering. Pacific Ocean data suggest that lead pollutants have penetrated to depths of about 1000 meters with strong contamination occurring in surface water of nearshore regions.

61021 APTIC NO. 76211

Ivlev, L. S., N. K. Spazhkina, O. Grigorov, and Y. L. Yanchenko

EFFECT OF HUMIDITY CHANGES ON THE OPTICAL AND MICROPHYSICAL CHARACTERISTICS OF AN ATMOSPHERIC AEROSOL. *Probl. Fiz. Atm., no. 8:112-123, 1970. 11 refs. Translated from Russian. Leo Kanner Assoc., Redwood City, Calif., 20p., Sept. 5, 1974.*

The condensation growth of aerosol particles when the relative humidity of the atmosphere is less than 100% is discussed. The condensation growth of individual particles, the size distributions of aerosol particles for different relative humidities of the medium, and the optical characteristics of aerosol distributions are calculated. The growth of aerosol particles during changing humidity was also investigated experimentally in a chamber in which the humidity was regulated. The particles that were studied settled on a clean glass plate which was examined under an optical microscope. Measurements on various types of aerosols are presented graphically.

61022 APTIC NO. 38124

Keeling, Charles D.

IS CARBON DIOXIDE FROM FOSSIL FUEL CHANGING MAN S ENVIRONMENT? *Proc. Am. Phil. Soc., 114(1):10-17, Feb. 1970. 17 refs.*

The annual input to the atmosphere of carbon dioxide from fossil fuels has increased from 0.06 ppm in 1850 to 2.0 ppm in 1970. However, continuous measurements made at Mauna Loa Observatory, Hawaii, and the South Pole since 1957 show a decrease in atmospheric CO2 concentrations during a period when the rate of CO2 inpur was increasing. That the surface layer of ocean water has not been the principal agent for removing fossil fuel CO2 from air is suggested by the fact that CO2 is entering the oceans at the rate proportional to the CO2 partial pressure difference at the sea surface (a constant 311 ppm since 1958). In any case, the surface layer of ocean water is insufficient to hold more than about 10% fossil fuel CO2, of which 40% remains in the atmosphere. An uncontrolled increase in atmospheric CO2 from fossil fuels poses the threat of climactic changes in the 21st century.

61023 APTIC NO. 84481

Laskowski, Wladyslaw and Kazimierz Pollak

METHODS OF REDUCTION OF SO2 EMISSION WITH REFERENCE TO COKING PLANTS. *(Sposoby Ograniczenia Uciazliwosci Emisji SO2 Omowione Na Przykladzie Koksowni). Text in Polish. Koks, Smola, Gaz, 15(2):40-49, 1970. 12 refs.*

The difficult problems of limiting SO2 emission and factors related to it, exemplified by a 4-battery coking plant, were discussed. These factors involved the harmfulness of SO2 emitted during heating with generator and coking gas, atmospheric turbulence, meteorological conditions, effect of chimney height, spacial location of emitters, distribution of areal air pollution and effect of fuel gas type. It was concluded that the lowest SO2 concentration in a 4-battery coking plant with chimneys in a straight line on the windward side, occurred at a wind direction perpendicular to the line of chimneys; the highest concentration at a wind direction parallel to this line; intermediate concentration at any other wind direction. It follows from these observations that the array of chimneys would best be erected perpendicularly to the prevailing wind direction in the area. Sulfur dioxide concentration leeward from the emitters clearly decreased with increasing distance from the emitters at a wind direction perpendicular to the line of emitters. It decreased very slowly when the wind was parallel to this line. No residential district was to be built within a broad belt in an extension of both directions from the emitter line to a distance of 3-5 km. Greater chimney height clearly decreased SO2 concentration at a considerable distance from this site (lateral deviation). Appropriate location and differentiation of emitter height might somewhat alleviate the trouble caused by SO2 emission. Generator gas, due to its high hydrogen sulfide content, and desulfurized gas, because of its low caloric value, were considered to be uneconomical. Desulfurized coking gas constituted one of the most valuable fuels because it protected the air from SO2 pollution. Topographic and meteorological conditions, included in the planning for a coking plant, would tend to reduce SO2 emission problems.

61024 **APTIC NO. 72740**

Munn, R. E., J. Tomlain, and R. L. Titus

A PRELIMINARY CLIMATOLOGY OF GROUND-BASED INVERSIONS IN CANADA. *Atmosphere, 8(2):52-68, 1970. 11 refs.*

Vertical temperature differences from rawinsondes and meteorological towers are used to obtain frequencies of ground- based inversions across Canada for the period July 1965 to June 1968. Radiation inversions persist for relatively long periods of time in the Canadian arctic during the winter and contribute to the high air pollution potential of the area. Other regional meteorological problems related to pollution potential include advection inversion and anticyclones along the Atlantic coast during the spring and summer, the trapping of cold pools of air in the Ottawa-St. Lawrence valleys and in the Rockies, and the Chinook inversion in Alberta. The temperature measurements were made at open countryside locations, and thus regional estimates of inversion frequencies can not be extrapolated to locations subject to topographical or urban influences.

61025 **APTIC NO. 43068**

Peterson, James T.

CALCULATIONS OF SULFUR DIOXIDE CONCENTRATIONS OVER METROPOLITAN ST. LOUIS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Div. of Meteorology, 21p., 1970. 5 refs.*

Eigenvectors, or empirical orthogonal functions, previously used by the author to derive relationships between meteorological parameters and city-wide distributions of sulfur dioxide concentrations throughout metropolitan St. Louis, Missouri were used with independent meteorological data in this study to calculate SO2 concentrations at the St. Louis sites. Comparisons between the results of several sets of such calculations and observed SO2 values are presented. Disparities between observed and calculated values are traced to the time intervals studied, in accuracies in meteorological data, variations of SO2 source strength during the observation period, and the inability of the formulated eigenvector patterns to fully reflect the original SO2 observations. (Author abstract modified)

61026 **APTIC NO. 41314**

Fuji Municipal Office (Japan), Computer Section

CALCULATION CHART OF DISTRIBUTION OF SULFUR OXIDES POLYMERIZED CONCENTRATION IN MAIN FACTORIES (26 FACTORIES, 47 SMOKE SOURCES) ACCOMPANIED TO PREVENTION PLAN FOR AIR POLLUTION. *(Taikiosen boshi keikaku ni tomonau shuyokojo (26 kojo 47 engen) no iousankabutsu jugonodo bunpu santeizu). Text in Japanese. 188p., May 1970.*

In order to determine the amount of sulfur oxides emitted per unit-time and effective height of a chimney, discharging standards of a smoke source and polymerized concentrations of waste smoke were calculated. In the diffusion theory, a formula for checking discharging standards was used, and a theoretical formula for plume behavior and diffusion was computed. Maps and charts on winds and computer programs are included.

1969

61027 **APTIC NO. 42488**

Blifford, Irving H., Jr. and Lynn D. Ringer

THE SIZE AND NUMBER DISTRIBUTION OF AEROSOLS IN THE CONTINENTAL TROPOSPHERE. *J. Atmospheric Sci., 26(4):716-726, July 1969. 15 refs.*

A series of 22 aerosol collections made during 1966 at altitudes to 10 km in the vicinity of Scottsbluff, Neb., were analyzed. Several additional samples were taken at other locations in the central U. S. when low tropopause conditions permitted collecting in the lower stratosphere. A few additional measurements were made over Limon, Colo. The sampling device was an aircraft-mounted single-stage impactor. Particle size number and distributions were determined by direct counting from photomicrographs. Systematic changes were observed in the aerosol distribution function with altitude in which both the large and small particulates diminish with height. Short-term variations in the size and number distribution, seasonal changes, and correlations with various meteorologic parameters were investigated. Characteristic aerosol distribution functions for tropospheric and lower stratospheric air were found on occasions of low tropopause. Correlations of the total number of large and intermediate size particles with relative humidity and a more or less constant mixing ratio of intermediate-sized particles with altitude suggest the importance of cloud modification processes in determining the aerosol distribution function. (Author abstract modified)

61028 **APTIC NO. 43567**

Perelman, A. Y. and K. S. Shifrin

USE OF LIGHT SCATTERING FOR THE DETERMINATION OF THE STRUCTURE OF DISPERSE SYSTEMS WITH A POWER-LAW DISTRIBUTION. *Opt. I Spektroskopiya (English translation), 26(6):548-551, 1969. 14 refs.*

A calculation of the polydisperse coefficient of scattering and the polydisperse luminousity is presented for a model with a power-law distribution which is used in the description of an atmospheric aerosol. Two methods were developed, permitting the calculation of the particle size distribution using optical information. Information about the three-dimensional polydisperse scattering coefficient and the polydisperse scattering indicatrix served as input data. Solution of the inverse problems is given in the form of contour integrals. A method is given for the separation of the single valued branch, describing the desired distribution of particles. (Author abstract modified)

1968

61029 **APTIC NO. 44016**

Kurita, Hidemi

RELATION BETWEEN THE AMOUNT OF DUST FALL AND PRECIPITATION. *(Kojinryo to kosuiryo no kankei). Text in Japanese. Nagano-ken Eisei Kenkyusho Chosa Kenkyu Hokoku (Bull. Nagano Prefect. Inst. Public Health), no. 82:1-20, Sept. 1968. 20 refs.*

The relationship between the amount of dust fall and precipitation was statistically examined. The amount of dust fall equals a constant times the average concentration of pollutant times (1 + precipitation/rate of fall of the pollutant). The equation differs with different pollutants and precipitation conditions but statistically is based on the amount of dust fall measured and precipitation. Soluble components in dust fall were 120 mm/ 30 days and insoluble components were 1000-2000 mm/30 days. The amount of dust fall was significantly affected by precipitation and increased with the rate of precipitation/rate of dust fall. So it was inadequate as an index of the concentration of pollutants in air. The amount of natural dust fall was given as a formula (constant times pollutant concentration equals amount of dust fall/l + precipitation/dust fall rate) which means that the amount of dust fall excluded the amount affected by precipitation. Thus, it was more adequate as an index of the concentration of dust fall in air because this value was flexible with the change of concentration of other pollutants.

1944

61030 **APTIC NO. 40796**

Hewson, E. Wendell

ATMOSPHERIC POLLUTION BY HEAVY INDUSTRY. *J. Ind. Eng. Chem., 36(3):195-201, March 1944. 3 refs. (Presented at the Joint Meeting of the Royal Meteorological Society, Canadian Branch, and the Toronto Chemical Association, Toronto, Ontario, Nov. 8, 1943.)*

A method of reducing atmospheric pollution by varying the emissions with meteorological conditions was adopted by a smelter releasing sulfur dioxide into the atmosphere. By releasing the maximum concentrations of combustion products when diffusion was poor, SO2 damage to vegetation in the British Columbia River Valley area was reduced. Based on measurements of lateral and vertical distribution of SO2 emission and the air movements in the valley, i.e., turbulence, the cause of the majority of fumigations was determined as differential heating of the valley sides by the sun. Turbulence in the lower layers is closely related to the topography of the surface over which the air flows, to wind velocity, and to the rate of change of temperature with height, i.e., the lapse rate. Graphic data on characteristics diurnal fumigations, topography, variations of SO2 concentrations with altitude, and wind movements are included.

BASIC SCIENCE AND TECHNOLOGY

1976

61031 **APTIC NO. 83550**

Ames, D. L. and D. W. Turner

PHOTOELECTRON SPECTROSCOPIC STUDIES OF DINITROGEN TETROXIDE AND DINITROGEN PENTOXIDE. *Proc. Roy. Soc. London Ser. A, 348(1653):175-186, Feb. 24, 1976. 11 refs.*

Photoelectron spectrometric studies of dinitrogen tetroxide and dinitrogen pentoxide are described. The rapid expansion of vapor through a nozzle inlet system is used for the study. Comparison is made with Gaussian ab initio molecular orbital calculations and with the spectra of the dissociated species. The relation to nitric acid is noted. Geometrical structures are considered in the case of dinitrogen pentoxide. A planar form with a nitrogen-oxygen-N angle of the order of 120 deg is most consistent with the p.e.s. results. (Author abstract modified)

61032 **APTIC NO. 81096**

Axworthy, A. E., G. R. Schneider, M. D. Shuman, and V. H. Dayan

CHEMISTRY OF FUEL NITROGEN CONVERSION TO NITROGEN OXIDES IN COMBUSTION (FINAL REPORT). *Rockwell International, Canoga Park, Calif., Rocketdyne Div., Environmental Protection Agency Contract 68-02-0635, Program Element 1AB014, ROAP 21ADG-08/21BCC- 12, Rept. EPA-600/2-76-039, R-9698, 371p., Feb. 1976. 148 refs.*

The chemical mechanisms involved in the conversion of fuel nitrogen to nitrogen oxides during combustion were investigated. The studies included: an examination of the pyrolysis of fossil fuels and model fuel nitrogen compounds, the development of droplet and particle combustion models, and an investigation of the conversion of hydrogen cyanide and ammonia to nitrogen oxides on low-pressure methane-oxygen-argon flames. Decomposition rates and products were measured in helium over a temperature range of 850-1100 C for pyridine, benzonitrile, quinoline, and pyrrole; and products were measured for six Number 6 fuel oils, one crude oil, and two coals. Hydrogen cyanide was the major nitrogen- containing pyrolysis product, and the amount formed increased with temperature. Ammonia was a minor product, and little if any nitrogen was formed. Fuel nitric oxide formed relatively slowly above the luminous zone in the same region where carbon monoxide is oxidized to carbon dioxide or later during the burner experiments. Although HCN and NH3 gave similar yields of NO, NH3 reacted very early in the flame front, while most of the HCN survived the luminous zone and then reacted slowly. A mechanism for the formation of fuel NO was postulated. (Author abstract modified)

61033 **APTIC NO. 83343**

Ay, J. H. and M. Sichel

THEORETICAL ANALYSIS OF NO FORMATION NEAR THE PRIMARY REACTION ZONE IN METHANE COMBUSTION. *Combustion Flame, 26(1):1-15, Feb. 1976. 32 refs.*

The complete kinetics of the methane-air reaction are used to study the details of nitric oxide formation near the primary reaction zone. The species and energy conservation equations are used in the analysis, but diffusion and heat conduction within the reaction zone are neglected. The overshoot of the concentrations of the oxygen, hydroxide, and hydrogen radicals over their post flame equilibrium values explain the phenomenon of prompt NO due to the very high NO formation rate near the flame for values of the equivalence ratio Phi is less than 1.1. The effects of flame parameters on this radical overshoot were investigated. The results of the equilibrium theory were compared in detailed kinetic calculations. Computations with and without hydroperoxy radical reactions were compared. (Author abstract modified)

61034 **APTIC NO. 81884**

Bertocci, U., M. Cohen, W. S. Horton, T. Negas, and A. R. Siedle

MIXED OXIDES FOR FUEL CELL ELECTRODES (FINAL REPORT). *National Bureau of Standards, Washington, D. C., Environmental Protection Agency Interagency Agreement D4-0528, Program Element 1AB013, ROAP 21BKR-007, Rept. EPA-600/2-76-007, NBSIR 75-742, 56p., Jan. 1976. 23 refs.*

Studies dealing with the preparation, chemical stability, and electrochemical behavior of mixed oxides that were selected as potential candidates for acid fuel cell electrodes are reported. Mixed oxides containing rare earths (cesium and/or praeseodymium) and certain transition metals (titanium, vanadium, niobium, and tantalum) appeared to be good candidates for electrocatalytic applications in hot acid fuel cells based on considerations of stoichiometry and electron transport properties. Barium ruthenate, although exhibiting stability in hot, phosphoric acid, appeared to change chemically during the passage of electric current; hence, this material may not be useful as a catalyst for the oxygen electrode of an acid fuel cell. Alkaline earth titanates, manganates, and cobaltates were soluble in hot phosphoric acid and are therefore unsuitable as catalysts for acid fuel cells. (Author conclusions modified)

61035 **APTIC NO. 82590**

Billings, Charles E. and Robert A. Gussman

DYNAMIC BEHAVIOR OF AEROSOLS. *In: Handbook on Aerosols. Richard Dennis (ed.), U. S. Energy Research and Development Administration, 1976, Chapt. 3, p. 40-65. 111 refs.*

NTIS: TID-26608

Analysis of aerosol behavior usually requires simultaneous consideration of interactions of particles with gas contituents and other suspended particles, and motion of individual particles or clouds in a defined flow field and with respect to immersed obstacles of flow boundaries. Particle characteristics that influence behavior include physical configuration, bulk material properties, and surface or interfacial phenomena. Related characteristics of the suspending gas or flow boundaries may affect behavior in a specific system. Aerosol behavior for typical flow systems of practical interest is summarized. (Author abstract modified)

61036 **APTIC NO. 83621**

Brushwell, William

COATINGS UPDATE. CHAPTER 3. POLLUTION AND THE PAINT INDUSTRY. *Am. Paint Coatings J., 60(33):52-55, Jan. 26, 1976. 39 refs.*

An annotated bibliography on the technology and scientific work related to air pollution is presented. The topics include: air quality modeling of pollutants on regional and extended spatial scales; photochemical smog formation; air quality in Los Angeles County; monitoring of air pollution in a paint industry plant; transport of ozone from the stratosphere to the troposphere; acid precipitation in the northeastern United States; effect of sulfur dioxide and ozone on organic coatings; the effects of air pollution in the coating industry in Japan, Great Britain, and Germany; and the safety regulations regarding vinyl chloride.

61037 **APTIC NO. 83576**

Butt, John B.

PROGRESS TOWARD THE A PRIORI DETERMINATION OF CATALYTIC PROPERTIES. *Am. Inst. Chem. Engrs. J., 22(1):1-26, Jan. 1976. 90 refs.*

Catalytic chemisorption/titration methods which provide a significant amount of information regarding the nature of acid oxide and supported metal surfaces are discussed. Chemisorption methods for characterization of group VIII metals are based on the well known fact that hydrogen chemisorption on most of them is dissociative with hydrogen atom bonding to individual surface metal atoms. Carbon monoxide chemisorption is nondissociative with bonding to surface atoms. These systems generally exhibit typical Langmuir adsorption isotherms, so that determination of monolayer adsorption gives directly the same number of surface metal atoms via the chemisorption stoichiometry, H/M or CO/M, respectively. For supported metals such data supply at least qualitative information concerning the dimensions of individual metal particles or crystallites on the surface. Representative data on the chemisorption of hydrogen and CO on several group VIII metals supported on silica are illustrated.

61038 **APTIC NO. 82592**

Corn, Morton and Nurtan A. Esmen

AEROSOL GENERATION. *In: Handbook on Aerosols. Richard Dennis (ed.), U. S. Energy Research and Development Administration, 1976, Chapt. 2, p. 9-39. 248 refs.*

NTIS: TID-26608

The generation of coarse, unstable dusts and mists as well as relatively stable dispersions is discussed. Aerosols are generated in the laboratory for calibration of measurement equipment, studying the properties of particles, evaluation of control equipment, and physiological studies. Artificially generated aerosols are also used in the field to study atmospheric interactions. Different generation rates are required for different uses. A test system must generate particles of predictable size distribution. Possible variations in particle shape and density are discussed. The required sensitivity of aerosol analysis is a factor in the choice of generator. Liquid aerosols can usually be generated with lower standard deviations of particle size than those associated with solid aerosols. They are typically comprised of spherical droplets. However, there is evidence that droplets can bounce, slide, and spread after impact. Droplets can grow and shrink by diffusion of vapor to and from the surface; also, the factors influencing droplet collision are not thoroughly understood. The basic mechanisms for aerosol formation are discussed, including both dispersion and condensation. (Author abstract modified)

61039 **APTIC NO. 82553**

Darby, William P. and Constantine J. Gregory

COMMENT ON EVALUATING COMPLIANCE WITH AIR POLLUTION LEVELS NOT TO BE EXCEEDED MORE THAN ONCE A YEAR. *J. Air Pollution Control Assoc., 26(3):233-234, March 1976. 5 refs.*

A critique of the computational procedures available for estimating expected ambient air pollutant concentrations from empirical data made by Neustadter and Sidik is given. The authors provide a useful numerical evaluation of the errors inherent in Larsen s recommended procedure. Because the errors are evaluated as functions of sigma, the interpretation of the results is misleading. The authors correctly state that the margins of safety due to using the expected annual maximum concentration instead of the expected annual SMP as a design value are 63% when sigma is 1.5 (sg equals 3.1) and 117% when sigma equals 2.5 (sg equals 22.8). More typical values of the margins of safety are 32% when sg equals 1.5 (sigma equals 0.9) and 52% when sg equals 2.5 (sigmal equals 1.4). Over a normal range 1.3 is less than sg is less than 2.7, the margins of safety are 25 to 120%, considerably less than the 60 to 120% suggested by the authors as typical. Much less significantly affected are the values of under estimation due to inverting the order of expectation and exponentiation. Typical values (for 1.3 less than sg less than 2.7) are 2-4%, not 4-8% (for 1.3 less than sigma less than 2.7) as stated by the authors.

61040 **APTIC NO. 84020**

Davenport, John E., Tom G Slanger, and Graham Black

THE QUENCHING OF N(2D) BY O(2P). *J. Geophys. Res., 81(1):12-16, Jan. 1, 1976. 19 refs.*

The rate coefficient for the quenching of nitrogen by oxygen was measured using an afterglow source and resonance absorption detection for N(2D). Quenching by known concentrations of O atoms generated by nitric oxide titration of a N2 discharge is compared with the quenching by O2, nitrous oxide, and carbon dioxide, for which the rate coefficients are well known. The rate constant for N(2D) quenching by O(2P) derived in this manner is (1.8 + or - 0.6) times 10 to the -12th power cu cm/molecule/sec at 315 K. A small increase with temperature in this rate constant relative to that for O2 is consistent with an activation energy 1 + or - 0.5 kcal/mol for N(2D) + O(2P). This information is relevant to the development of models that identify natural sources and sinks of NO. (Author abstract modified)

61041 **APTIC NO. 83067**

Dows, David A. and Hyun Chai Jung

ELECTRIC FIELD-INDUCED SPECTRUM OF CARBON DISULFIDE: EXCITED STATE DIPOLE MOMENT. *J. Mol. Spectr., 59(2):255-269, Feb. 1976. 9 refs.*

The electric field-induced spectrum (EFS) of carbon disulfide vapor was observed in a number of vibronic bands in the 3300 to 3750 angstrom region. It was possible to measure the electric field-induced spectrum of CS2 vapor in the R- and S-band regions, though the signals were quite small. The effect arises because CS2 is bent in the excited state, and possesses a dipole moment. No EFS spectrum was detected in the V-band region at shorter wavelengths, suggesting that the molecule is not bent in the corresponding excited state. Some correlation exists between the ratio of parallel and perpendicular EFS and the band type. The detail of the spectra includes a point where singularities appear in the intensity factors of the theory, and which can be used to determine the A prime rotational constant. Consideration of these lineshapes gives a confirmation of the value of A prime near 4.3/cm. The excited state moment is 0.7 D for the bands which show EFS. A calculation was carried out to study the 3A2 state of CS2. The molecular angle was taken to be 135 deg and the carbon to sulfur distance 1.64 A. The result was a dipole moment of 0.83 D, with the carbon atom more negative than the sulfurs. (Author abstract modified)

61042 **APTIC NO. 76133**

Engleman, Victor S.

SURVEY AND EVALUATION OF KINETIC DATA ON REACTIONS IN METHANE/AIR COMBUSTION. *Exxon Research and Engineering Co., Linden, N. J., Environmental Protection Agency Contract 68-02-0224, Program Element 1AB014, ROAP 21BCC-013, Rept. EPA-600/2-76-003, 477p., Jan. 1976. 530 refs.*

A survey and evaluation of kinetic data on the chemical reactions involved in methane/air combustion at 1 atm pressure, 80-125% stoichiometric air, and combustion temperatures between 1500 and 2500 K are presented. Information on thermochemistry and rate estimates for potentially important reactions for which no satisfactory rate data are available are presented in addition to a literature survey of reported rate data. Chemical species involved in methane-air combustion which are discussed include: nitric oxide, nitrous oxide, nitrogen dioxide, carbon monoxide, carbon dioxide, hydrogen, nitrogen, and formaldehyde.

61043 **APTIC NO. 83565**

Fryer, Colin and Owen E. Potter

EXPERIMENTAL INVESTIGATION OF MODELS FOR FLUIDIZED BED CATALYTIC REACTORS. *Am. Inst. Chem. Engrs. J., 22(1):38-47, Jan. 1976. 15 refs.*

The two-phase and backmixing models were compared with experimental results from a study of the catalytic decomposition of ozone on particles of mean diameter 117 micron in a reactor of 22.9 cm diameter. Bubble diameter varied linearly with height up to a size of 10 cm equivalent diameter. The shapes of the observed axial concentration profiles were predicted only by the backmixing model with a critical gas velocity of 5 cm/sec. At velocities below this, the ozone concentration decreased gradually from distributor to bed surface, but at higher velocities passed through a minimum value at a position within the bed. The backmixing model in the form presented by Fryer and Potter provided a good description of the reactor behavior. (Author conclusions modified)

61044 **APTIC NO. 82350**

Hanami, S.

ON THE BIOLOGICAL ENVIRONMENT CONTROL FACILITIES. *(Seibutsu kankyo shosetsu shisetsu ni tsuite). Text in Japanese. Kenchiku Setsubi (Architectural Equipment), 27(2):12-16, 1976.*

Biotron systems for controlled experimental exposure of organisms to pollutants are described. Several biotrons such as phytotron, homotron, zootron, aquatron, insection and fungitron are described, with detailed descriptions of phytotron and homotron. The phytotron system, which is used to expose plants to combined or single air pollutants, is an exposure chamber with a filter.

61045 **APTIC NO. 84230**

Kakas, Janos and Gyoergy Vigyazo

STUDY OF THE ELECTROSTATIC PHENOMENA AND ITS APPLICATION IN DUST TRANSPORTING AND DUST FILTERING SYSTEMS. *(Untersuchung der elektrostatischen Erscheinung und ihre Anwendung in Staubfoerder- und Staubfilteranlagen). Text in German. Staub, Reinhaltung Luft, 36(2):73-78, Feb. 1976.*

A study of electrostatic phenomena in dust transporting equipment is reported. The electric charge is due to three phsyically identical effects that differ, however, from a technological point of view: the wall influence, the probe effect, and the influence of volume. An instrument developed on the basis of this fact is suitable for an investigation of the operating state of different mechanical equipment, such as fluidation transport channels, transporting equipment with pressure vessels, and dust silos.

61046 **APTIC NO. 84164**

Kolar, Joergen

NOX EMISSIONS FROM GAS FIRED SYSTEMS - A SURVEY. *(NOx-Emissionen von Gasfeuerungen - ein Ueberblick). Text in German. Gas Wasserfach, Gas/Erdgas (Munich), 117(2):57-62, 1976. 85 refs.*

The thermal oxidation of nitrogen during combustion is reviewed. The reaction nitrogen + oxygen + 176 kJ equals 2 nitric oxide is temperature dependent. As the temperature rises from 1000 C to 1300 K, the reaction begins slowly, but the yield of NO increases rapidly as the temperature passes this range up to 2200 to 2400 K to reach a maximum. After the emissions leave the combustion chamber, the resulting NO is stable at the lower temperatures of the environment. Prolonged exposure to heat increases the yield of NO, and the usual exposure period ranges from 0.01-1 sec. The greater the oxygen content of the air, the greater the yield of NO. The higher oxides of nitrogen also form from NO according to the reaction 2 NO + O2 yields Z nitrogen dioxide, and directly from N2 and O2 at lower combustion temperatures (above 200 C but below 750 C). The NO2 in the emissions is eliminated by sulfur dioxide, (NO2 + SO2 yields NO + sulfur trioxide).

61047 **APTIC NO. 83081**

Lawson, J. David and A. W. Garst

HYDROCARBON GAS SOLUBILITY IN SWEETENING SOLUTIONS: METHANE AND ETHANE IN AQUEOUS MONOETHANOLAMINE AND DIETHANOLAMINE. *J. Chem. Eng. Data, 21(1):30-32, Jan. 1976. 7 refs.*

The solubility of methane and ethane in monoethanolamine and diethanolamine solutions was measured. The experimental procedures used to collect the data are presented along with selected data and graphs showing effects of temperature, amine concentration, and acid gas content. The solubilities of these hydrocarbons in the amine solutions are about the same as their solubility in an equal weight or volume of water. The type and concentration of amine, temperature, and presence of hydrogen sulfide and carbon dioxide affected the methane and ethane solubility. (Author abstract modified)

61048 **APTIC NO. 80550**

Lustig, M. and I. J. Solomon

A STUDY OF PAN-TYPE COMPOUNDS AND RELATED PRECURSORS (FINAL REPORT). *Illinois Inst. of Tech. Research Inst., Chicago, Ill., Environmental Protection Agency Grant R 802966-01, Program Element 1A1008, Rept. EPA-600/3-76-012, 18p., Jan. 1976. 4 refs.*

An ideal preparative procedure for peroxyacetyl nitrate (PAN) was found, high yields of PAN obtained, and a satisfactory preparative technique adapted for its purification. Acyl and acylperoxy radicals are precursors to PAN in photochemical environments containing acyl derivatives, oxides of nitrogen, and oxygen. Decomposition of PAN produced hydrocarbons and oxygen as well as methyl nitrate, carbon dioxide, and nitromethane. Additional characterization data were obtained corroborating the structure established for PAN. (Author abstract modified)

61049 **APTIC NO. 84105**

Masek, V.

THERMAL PROPERTIES OF SELECTED FLY DUSTS AND COMPOSITION OF ITS TAR SUBSTANCES. *(Thermische Eigenschaften der ausgewaehlten Flugstaeube und Zusammensetzung ihrer Teersubstanzen). Text in German. Zbl. Arbeitsmed., 26(2):33-37, 1976. 4 refs.*

Thermal properties of selected fly dusts and the composition of their bituminous substances derived from the fine dusts of the tar and pitch-processing industries and bituminous coverage on highways are discussed. Thermal analysis was performed with a thermal scale working on the compensation principle. Another instrument (DTA) used a dynamic method indicating the caloric substance of a physical or chemical change in the system measured. The substance under study and an inert one with no thermal conversion were heated in an oven and the differences of their voltage (temperature differential between test and inert substances) were measured. Use of another atmosphere than air (argon or nitrogen) was possible in a 3rd instrument. The thermocouples were connected with a 2-line compensation recorder. Quality analysis was performed with a chromatograph equipped with a flame-ionization detector. Another device carried out comparative waste-gas determinations of the entire sample of lung-penetrating and non-penetrating fine dust particles in air or argon between a temperature range of 25-1400 C. The former particles showed higher degasification losses than the latter. The entire samples were finally extracted with benzene in a nitrogen-atmosphere. The bituminous substances obtained were gas-chromatographically analyzed. The separate chemical substances were quantitively determined by absolute calibration.

61050 **APTIC NO. 83496**

Nordgren, J., H. Agren, L. O. Werme, C. Nordling, and K. Siegbahn

X-RAY EMISSION SPECTRA OF NH3 AND N2O. *J. Phys. B, 9(2):295-302, Feb. 1, 1976. 28 refs.*

The X-ray emission spectra of ammonia and nitrous oxide are reported, and the main X-ray transitions are identified. A correlation between nitrogen 1s binding energies was obtained by electron and X-ray emission spectroscopy. The differences between measured X-ray energies and X-ray energies calculated from electron spectroscopy are discussed. (Author abstract modified)

61051 **APTIC NO. 83768**

Pinnick, R. G., D. E. Carroll, and D. J. Hofmann

POLARIZED LIGHT SCATTERED FROM MONODISPERSE RANDOMLY ORIENTED NONSPHERICAL AEROSOL PARTICLES: MEASUREMENTS. *Appl. Opt., 15(2):384-393, Feb. 1976. 16 refs.*

Measurements of polarized light scattered from monodisperse nonspherical randomly oriented aerosol particles are presented along with Mie theoretical results for spheres of approximately the same cross sectional area. For slightly nonspherical particles of sodium chloride and potassium sulfate with size parameter greater than five, the intensity of light scattered was generally more than as predicted by Mie theory in the forward scattering lobe, but less at nonforward angles. For particles with size parameters less than five, the Mie results more closely matched the measurements. Measured angular scattering patterns for randomly oriented particles were smoother than the Mie theoretical results and nearly the same for salt and potassium sulfate particles of the same size. Measurements of particle depolarization were nearly independent of scattering angle. (Author abstract modified)

61052 **APTIC NO. 84278**

Poetzl, Karl, Reinhold Reiter, and Maciej Nowicki

GENERATOR FOR ULTRA FINE MONODISPERSE AEROSOL PARTICLES. *(Generator fuer ultra-feine monodisperse Aerosol-Partikeln). Text in German. Staub, Reinhaltung Luft, 36(2):65-69, Feb. 1976. 6 refs.*

Ultrafine particles (diameter less than 0.02 millimicron) are required for a number of industrial processes. Techniques are needed for the generation and detection of monodispersed, ultrafine aerosols. A generator is described that operates by atomizing salt solutions in a hydrogen flame. The quantity and concentration of the metallic salt solution sprayed into the flame determine the diameter and size distribution of the metallic oxide particles. More than 98% of the particles have a diameter of less than 0.008 millimicron. The particle number was measured by Aitken nuclei counter, and the particle concentration by radioactive labeling.

61053 **APTIC NO. 83709**

Sammes, P. G.

SOME NECESSITIES AND NICETIES OF ORGANIC CHEMISTRY. *Chem. Ind. (London), no. 2:47-50, Jan. 17, 1976. 9 refs.*

Some of the current pressures confronting organic chemistry are analyzed. Important parameters in the character of a university department are discussed. The distinctions between academic research and applied industrial research should be further broken down. Collaborative schemes focus the attention of the organic chemist onto the relevance of his scientific work and on its implications on society as a whole. It is generally an ignorance of chemistry that causes pollution. To show how easily problems can be created, aerosol spray propellants are discussed. Radiation decomposes these normally inert gases at high altitudes, and ozone reacts with the decomposition products. Quantitative chemical data are needed to determine whether molecules of these gases in the upper atmosphere could destroy the ozone layer protecting life on earth. Situations involving organic chemistry are also discussed. One of the human body s detoxification mechanisms is a hydroxylation reaction catalyzed by enzymes which act as very powerful oxidizing agents. Attempts have been made to build a simple chemical model which imitates these enzymes for the hydroxylation of aromatic substrates. Another application of organic chemistry is the production oof cephalosporin C antibiotic, which formerly involved low yielding processes. The discovery that a penicillin to cephalosporin transformation occurred by an unusual thermal mechanism made commercial production of cephalosporins possible.

61054 **APTIC NO. 83591**

Valdman, B. and R. Hughes

A SIMPLE METHOD OF CALCULATING EFFECTIVENESS FACTORS FOR HETEROGENEOUS CATALYTIC GAS-SOLID REACTIONS. *Am. Inst. Chem. Engrs. J., 22(1):192-194, Jan. 1976. 7 refs.*

A simple method of calculating the effectiveness factors for heterogeneous catalytic gas solid reactions was developed. The method gives very good agreement with a more exact solution. The method is confined to isothermal or near isothermal conditions. It requires, in combination with the asymptotic approximation, only the solution of a simple algebraic equation to determine particle effectiveness for any particular value of the Thiele modulus.

61055 **APTIC NO. 83548**

Wendt, J. O. L. and O. E. Schulze

ON THE FATE OF FUEL NITROGEN DURING COAL CHAR COMBUSTION. *Am. Inst. Chem. Engrs. J., 22(1):102-110, Jan. 1976. 32 refs.*

The physical and chemical characteristics that influence the conversion of fuel nitrogen to nitrogen oxides during coal char combustion were theoretically examined. A simplified model was used in which nitric oxide was an intermediate product between fuel nitrogen and N2. Diffusion reaction interactions were important in determining the selectivity of the char particles toward NO production. At low temperature fluidized bed combustion conditions, pore size was important, and low conversion of fuel nitrogen to NO was favored by long narrow pores. Under high temperature pulverized coal combustion conditions, the model provides insight into mechanisms of NO formation and predicts the observed weak temperature dependence of fuel nitrogen conversion, as well as a significant effect of particle size. (Author abstract modified)

61056 **APTIC NO. 82591**

GCA Corp., Bedford, Mass., GCA/Technology Div.

SUMMARY TABLES AND GRAPHS FOR STATIC AND DYNAMIC CHARACTERISTICS OF AEROSOL SYSTEMS. *In: Handbook on Aerosols. Richard Dennis* (ed.), U. S. Energy Research and Development Administration, 1976, Chapt. 6, p. 118-136. 10 refs.

NTIS: TID-26608

The important static and dynamic aerosol properties and functional groups repeatedly encountered in aerosol studies are discussed. Tables and graphs pertaining to particle mechanics, dealing mainly with the factors controlling particle motion in the suspending gas stream are given. Particle drag coefficients are given as a function of particle Reynolds number, and a procedure is described for computing particle terminal velocities. Nomographs are provided for estimating particle losses in sampling lines due to gravitational settling or diffusion to the tube walls. Data indicating characteristic gas properties that are important in describing aerosol systems are presented. Conversion factors between various types of units are also included.

1975

61057 **APTIC NO. 76379**

Abrahamson, J.

COLLISION RATES OF SMALL PARTICLES IN A VIGOROUSLY TURBULENT FLUID. *Chem. Eng. Sci., 30(11):1371-1379, 1975. 22 refs.*

The collison rates of small particles in a vigorously turbulent fluid were calculated. Previous calculations are suitable only for low intensity turbulence, such as that found in water treatment plants. The assumption of independent particle velocities as in the gas kinetic theory is appropriate for the high intensity turbulence generated in suspensions being pumped and mixed under normal industrial conditions. The collision rate is calculated with and without gravitational or centrifugal forces also acting on the particles. (Author abstract modified)

61058 **APTIC NO. 83110**

Adinskov, B. P. and N. G. Zalozhnykh

OXIDES OF NITROGEN FORMATION DURING THE OPERATION OF INFRARED RADIATION BURNERS. *(Obrazovanie okislov azota pri rabote gorelok infrakrasnogo izlucheniya). Text in Russian. Gaz. Prom., vol. 7:55-57, 1975.*

The formation of oxides of nitrogen was investigated in an original study during the operation of laboratory and industrial infrared radiation burners with various types of emitters. Tests were conducted under working conditions with the emitter positioned horizontally at a 15 deg angle. Under all conditions, independent of changes in the temperature of the emitter and the coefficient of air excess, an investigation of an infrared radiation burner with a ceramic and mesh emitter showed the amount of oxide of nitrogen in the undiluted products of combustion to be 5-7 mg/cu m, which does not exceed the maximum permissible level. An investigation of a laboratory model of a burner with a metal emitter showed the content of oxide of nitrogen in the products of combustion to range from 3-14 mg/cu m, depending upon the change in grid temperature, heat loads, and the coefficients of air excess. An investigation of a lantern type burner with a metallic emitter working on natural and liquefied gas showed the emission of oxide of nitrogen to be independent of the type of gas, while the coefficient of air excess was significant.

61059 **APTIC NO. 83901**

Alkhazov, T. G., G. Z. Gazan-Zade, M. O. Osmanov, and M. Y. Sultanov

CATALYTIC ACTIVITY OF TRANSITION METAL OXIDES IN REACTIONS OF NITRIC OXIDE WITH CARBON MONOXIDE. *(Kataliticheskaya aktivnost okislov perekhodnykh metallov v reaktsii vzaimodeystviya okisi azota s okis yu ugleroda). Text in Russian. Kinetika i Kataliz, 16(5):1230-1233, Sept.-Oct. 1975. 13 refs.*

The catalytic activity of different transition metal oxides was studied in reactions of nitric oxide with carbon monoxide and oxygen in gaseous mixtures containing 0.7% of NO and CO at 100-500 C. The reaction of NO and CO yielded nitrous oxide and nitrogen on all catalysts. The proportion of nitrogen relative to N2O increased with increasing temperature. All catalysts had a higher activity for the reaction of CO with oxygen than for the reaction of CO with NO. The following descending order of the catalytic activities was established: cupric oxide, tricobalt tetroxide, manganese tetroxide, ferric oxide, nickel oxide, chromic oxide, zinc oxide, vanadium pentoxide and titanium dioxide. The relationship between the catalytic activity and the bond energy of oxygen on the catalyst surface suggests that the reaction takes place not only according to the redox mechanism.

61060 **APTIC NO. 80201**

Apostolescu, N. and B. Gruenwald

CALCULATION OF NITRIC-OXIDE FORMATION IN THE CYLINDER OF THE S.I. ENGINE. PRESENT PROBLEMS. *Rev. Roumaine Sci. Tech. Ser. Electrotech. Energet., 20(3):459-466, 1975. 15 refs.*

The kinetic calculation of nitric oxide formation in the cylinder of the spark ignition engine is discussed. Calculation of the NO formation involves fundamental problems: the kinetic mechanism of NO formation, initiation of the mechanism, the rate constants of the reactions involved in the mechanisms, and the temperature of combustion products. The present stage and the future trends in the continuous progress in the calculation of the NO formation are outlined. (Author abstract modified)

61061 **APTIC NO. 83793**

Atroshchenko, A. V., G. K. Gonchareinko, and G. A. Shortsov

KINETICS OF THE PURIFICATION OF FLUE GASES WITH NITROGEN OXIDES CONTENT. *(Kinetika protsessa ochistki otkhodyashchikh gazov ot okislov azota). Text in Russian. Zh. Prikl. Khim., no. 7:1598-1599, 1975. 5 refs.*

The kinetics of flue gas nitrogen oxides reduction was studied. The research was conducted with a flue-type unit in a laboratory. An activator was added to an iron-based catalytic agent. The researchers studied kinetics of the procedure under the following conditions: gas space velocity 10,000 vol%; ammonia concentration 0.11 - 0.12 vol%; oxygen content 2.7 vol%; nitrogen oxides concentration 0.11 - 0.12 vol%; the gas carrier was nitrogen. There was practically no reaction on the catalyst within the 200-350 C range. The reaction was consecutive. It began to accelerate at 400 C and up, where K4 equals 0. The researchers concluded that there was a selective reduction of nitrogen oxide with ammonia at given temperatures.

61062 **APTIC NO. 75976**

Babb, Larry and Fredric Jaye

APPLICATION OF AUTOMATIC DATA PROCESSING TECHNOLOGY TO LABORATORY PROBLEMS (FINAL REPORT). *Aerotherm/Acurex Corp., Mountain View, Calif., Environmental Protection Agency Contract 68-02-1436, Program Element 1AB014, ROAP 21BCC-054, Rept. EPA-650/2-75-035, 54p., April 1975. 4 refs.*

NTIS: PB 244886/AS

A multiprogramming data acquisition system capable of gathering analog and digital data directly from the process instrumentation installed at the Environmental Protection Agency s National Environmental Research Center is described. The system design is based on a third generation mini-computer utilizing a modern multiprogramming operating system, cartridge disc storage media, high speed floating point arithmetic hardware, and wide range analog-digital conversion equipment. The data acquisition system is designed to eliminate the clerical tasks of data logging, conversion to engineering units, calculation of air/fuel ratios, and other parameters of interest as well as the correction of data to standard conditions.

61063 **APTIC NO. 76625**

Baker, R. T. K. and J. A. France

GROWTH CHARACTERISTICS OF SUPPORTED PALLADIUM PARTICLES IN GASEOUS ENVIRONMENTS. *J. Catalysis, 39(3):481-484, Sept. 1975. 7 refs.*

Controlled atmosphere electron microscopy (CAEM) was used to study the effect of argon, oxygen, hydrogen, ethylene, and acetylene on the nucleation and growth of evaporated palladium particles on graphite supports over a temperature range from ambient to 1000 C. The sizes of all particles increases with temperature, but their growth rates are extremely sensitive to the nature of the surrounding gas. In systems where particle mobility is not observed, particle growth takes place by transport of molecular metal species from one crystallite to another, either by migration across the support surface or via the gas phase. The escape of molecular species from a crystallite and their speed of migration are affected by the nature of the gaseous environment.

61064 **APTIC NO. 79693**

Baker, R. T. K., C. Thomas, and R. B. Thomas

CONTINUOUS OBSERVATION OF THE PARTICLE SIZE BEHAVIOR OF PLATINUM ON ALUMINA. *J. Catalysis, 38(1-3):510-513, June 23, 1975. 8 refs.*

Controlled atmosphere electron microscopy was used to follow the behavior of platinum particles, derived from three different sources, supported on an alumina film when heated to 920 C in oxygen or nitrogen. Platinum was introduced as the pure metal by vacuum evaporation of platinum from a wire mounted on a tungsten filament, from an atomized spray of a solution of chloroplatinic acid, and from an atomized spray of a solution of tetrammine platinous hydroxide. When platinum metal/alumina specimens were heated in 2 torr oxygen the evaporated metal nucleated at 500 C to form small particles. Particles decreased in both number and size above 800 C and there was a tendency for particles to reconstruct to form diffuse islands. The behavior of specimens of tetrammineplatinous hydroxide/alumina in 2 torr oxygen was almost identical to that of the metal, differing only in the relative sizes of particles found at various temperatures. Whiskers were observed on specimens of chloroplatinic acid/alumina at about 900 C. Similar behavior could be induced with platinum metal/alumina specimens heated to 500 C in 2 torr oxygen, exposed to hydrogen chloride at room temperature, and then reheated. The platinum particles remained irregularly shaped and immobile on the surface throughout the entire heating cycle, indicating that particle growth probably occurred via the movement of particles smaller than 2.5 nm in all experiments. Particle size variations with temperature were measured from the projected image of a film. The overall shapes of the particle growth curves in oxygen are similar and quite different to those obtained in nitrogen. The presence of chloride ions has a dramatic effect on the behavior of this system, tending to inhibit the growth of platinum particles on alumina. It is not possible to present any definite explanation for this observed phenomenon.

61065 **APTIC NO. 76300**

Barchet, W. R. and R. S. McKenzie

SILVER IODIDE AEROSOL PRODUCTION BY A PLATED HOT-WIRE GENERATOR. *J. Appl. Meteorol., 14(6):1151-1155, Sept. 1975. 14 refs.*

A technique is described by which nichrome heating elements may be uniformly coated with a substantial layer of silver iodide that gives rise to a stable source of AgI particles when electrically heated. The two stage process involves silver plating followed by iodinization to eliminate the problem of irregular coating. Seven percent of the particles are larger than 1 micron diameter, while the mean size is near 0.01 micron. Nearly 10% of the particles act as condensation nuclei at 0.1% supersaturation; however, only 0.2% of the particles act as ice nuclei at -16 C in an isothermal cloud chamber. The fraction active as ice nuclei increases as the aerosol concentration increases. Other benefits include long term stability and purity of AgI particle output. (Author abstract modified)

61066 **APTIC NO. 76332**

Bengtsson, S. and I. Bjerle

CATALYTIC OXIDATION OF SULPHITE IN DILUTED AQUEOUS SOLUTIONS. *Chem. Eng. Sci., 30(11):1429-1435, Nov. 1975. 22 refs.*

The rate of reaction of dissolved oxygen and sulfite ions in diluted aqueous solutions was investigated in homogeneous and in heterogeneous systems. Cobaltous sulfate is used as the catalyst. This reaction has industrial importance in abatement of air pollution by sulfur dioxide. The rate of sulfite oxidation is zero order with respect to oxygen and three-halves order with respect to sulfite. The influence of the catalyst concentration follows a square root dependence. The reaction rate constant increases with pH. The heterogeneous conditions result in a reaction rate that is one order of magnitude lower than under homogeneous conditions. This difference indicates an induction period of the sulfite oxidation. (Author abstract modified)

61067 **APTIC NO. 76007**

Benson, S. W., D. M. Golden, R. W. Lawrence, Robert Shaw, and R. W. Woolfolk

ESTIMATING THE KINETICS OF COMBUSTION - INCLUDING REACTIONS INVOLVING OXIDES OF NITROGEN AND SULFUR (FINAL REPORT). *Stanford Research Inst., Menlo Park, Calif., Environmental Protection Agency Grant R-800798, Program Element 1AB014, ROAP 21BCC-019, Rept. EPA-600/2-75-019, 116p., Aug. 1975. 45 refs.*

NTIS: PB 245054/AS

A method of estimating the rate constants of chemical reactions occurring in combustion systems, including those involving the production and destruction of sulfur oxides and nitrogen oxides is presented. Particular emphasis is placed on atom transfer reactions between atoms and diatomic molecules containing the elements carbon, hydrogen, nitrogen, oxygen, and sulfur. A FORTRAN computer program enables a user with no previous kinetics experience to estimate the rate constants at any temperature between 200 and 3000 K for any of 75 pairs of atom transfer reactions involving the above five elements. (Author abstract modified)

61068 **APTIC NO. 75975**

Bickelhaupt, R. E.

EFFECT OF CHEMICAL COMPOSITION ON SURFACE RESISTIVITY OF FLY ASH (FINAL REPORT). *Southern Research Inst., Birmingham, Ala., Environmental Protection Agency Contract 68-02-1303, Program Element 1AB012, ROAP 21ADJ-029, Rept. EPA-600/2-75-017, SORI-EAS-75-397, 3134-XV, 50p., Aug. 1975. 10 refs.*

NTIS: PB 244885/AS

Resistivity was determined for a group of well characterized fly ashes representing both Eastern and Western coals. Data were obtained between 60 and 250 C in an air environment containing approximately 9 vol% water. Chemical transference experiments were conducted for two ashes having substantially different chemical compositions and revealed a pronounced migration of alkali metal ions toward the negative electrode. The surface resistivity was inversely proportional to the concentration of these ions which in turn was especially influenced by the participation of potassium in the current conduction process. The sensitivity of surface resistivity to the chemical composition of fly ash was apparently due to the alkali metals serving as charge carriers, with the conduction

mechanism being probably analogous to that of glass. (Author abstract modified)

61069 **APTIC NO. 82544**

Bir Singh, Hanwant, Daniel Lillian, Alan Appleby, and Leon Lobban

ATMOSPHERIC FORMATION OF CARBON TETRACHLORIDE FROM TETRACHLOROETHYLENE. *Environ. Letters, 10(3):253-256, 1975. 18 refs.*

The atmospheric formation of carbon tetrachloride from tetrachloroethylene was investigated. Carbon tetrachloride is formed in the troposphere by the solar induced photochemical reactions of chlorinated alkenes. Carbon tetrachloride was experimentally observed during simulated tropospheric irradiations of synthetic mixtures of C2I4 in air. The photodecomposition of C2Cl4 led in 7 days to the formation by weight of 8% CCl4 and 70-85% phosgene. This source of CCl4 alone can account, depending on the residence time, for a significant fraction of the atmospheric CCl4 budget. The CCl4 is tropospherically stable.

61070 **APTIC NO. 82637**

Bittner, J. D., G. P. Prado, J. B. Howard, and R. A. Hites

THE FORMATION OF SOOT AND POLYCYCLIC AROMATIC HYDROCARBONS (PCAH) IN COMBUSTION SYSTEMS. *Preprint, Massachusetts Inst. of Tech., Cambridge, Fuels Research Lab., 14p., 1975. 11 refs. (Presented at the Polynuclear Aromatic Hydrocarbons Symposium, Columbus, Ohio, Oct. 15-17, 1975.)*

The formation of soot and polycyclic aromatic hydrocarbons in combustion systems is reviewed along with some preliminary measurements of soot mass loadings. Soot formation is postulated to involve the processes of aggregration and dehydrogenation, while polycyclic aromatic hydrocarbon species appear to serve as nuclei for soot growth by surface decomposition of hydrocarbon species. Polynuclear compounds are also postulated as being stable by-products of the soot formation process. Preliminary scoping runs to measure soot loadings with kerosene and air reveal a strong dependence of soot loading at the exhaust on atomizing air pressure. The soot emission increases four orders of magnitude for a decrease in atomizing air pressure from 20 psig to 10 psig. Previous measurements of nitrogen oxide emissions under similar conditions reveal NOx reactions amounting to a factor of two when the atomizing air pressure is decreased from 29 psig to 12 psig. This illustrates the extreme sensitivity of soot emissions and possibly polynuclear hydrocarbon emissions to changes in combustor firing practices designed to reduce NOx formation.

61071 **APTIC NO. 83117**

Bobrov, N. N., A. A. Davydov, and K. G. Ione

INFRARED SPECTRA OF CARBON MONOXIDE AND DIOXIDE ADSORBED BY NIY ZEOLITES. *(Ik-spektry okisi i dvuokisi ugleroda, adsorbirovannykh na tseolitakh NiY). Text in Russian. Kinetika i Kataliz, 16(5):1272-1279, Sept.-Oct. 1975. 21 refs.*

Infrared spectra of carbon monoxide and carbon dioxide were studied following their adsorption in a series of Y-type zeolites developed under different conditions of ion exchange. Several methods of introducing nickel (Ni) cations into zeolites were employed. The interaction of CO and CO2 with NiY zeolites was shown to be dependent upon conditions of the zeolite ion exchange. With an absence of cation hydrolysis during ion exchange, CO adsorption in NiY zeolites was not accompanied by CO oxidation. In the case of the adsorption of CO on NiY zeolites prepared under conditions of incomplete hydrolysis of cations, even at low temperatures the formation of carbonate-carboxylate structures, CO2, and the restoration of Ni(2+) cations to Ni(+) was observed.

61072 **APTIC NO. 80455**

Bond, Geoffrey C.

SMALL PARTICLES OF THE PLATINUM METALS. THEIR PREPARATION, CHARACTERISATION AND USE IN CATALYSIS. *Platinum Metals Rev., 19(4):126-134, Oct. 1975. 35 refs.*

Methods for the preparation of small particles of the platinum metals are reviewed. The economic use of noble metals as catalysts usually required them to be in the form of extremely small particles, typically less than 100 A in size. This is readily done by the well known techniques for preparing supported metal catalysts, which typically contain metal particles between 10 and 100 A in size. There are two other methods available: preparing colloidal dispersions of metal particles which have some limited practical uses as catalysts; and by evaporation of metal atoms from heated wires, and allowing them to condense on a cold surface. This technique is used in fundamental catalytic studies.

61073 **APTIC NO. 76339**

Bonzel, H. P. and J. J. Burton

CO OXIDATION ON A PT(110) SURFACE SOLUTION OF A REACTION MODEL. *Surface Sci., vol. 52:223-229, 1975. 13 refs.*

A reaction model for carbon monoxide oxidation on a platinum (110) surface was solved. The resulting carbon dioxide partial pressure versus time curves compare favorably to the experimental curves and provide evidence for a Langmuir-Hinshelwood (L-H) mechanism. The desorption energy of CO is close to 30 kcal/mole. The adsorption rate of oxygen on Pt(110) is very high, implying an initial sticking coefficient of O2 close to unity. The activation energy for the LH surface reaction between CO and O2 is 7.9 kcal/mole. (Author conclusions modified)

61074 **APTIC NO. 76327**

Bouse, L. F.

USE OF PULSED JETS TO ATOMIZE VARIOUS LIQUIDS. *Trans. ASAE (Am. Soc. Agr. Engrs.), 18(4):618-622, July-Aug. 1975. 5 refs.*

A sonic device was used to induce cyclic disturbances on the surface of liquid jets formed by a multiple orifice nozzle for the production of monodisperse spray. The requirement for using lower disturbance frequencies for high viscosity liquids than for low viscosity liquids results in larger drop sizes for the high viscosity liquids. Satellite drop production is more prevalent for the largest orifice diameter tested than for smaller orifice diameters and is less of a problem for high surface tension liquids (water and a glycerol water mixture) than for low surface tension liquids (ethanol, diesel oil). The minimum and maximum cyclic disturbance frequencies for the production of monodisperse spray are linearly related to jet velocity, the logarithm of the dynamic pressure and the theoretical frequency for producing uniform drops. (Author abstract modified)

61075 **APTIC NO. 80478**

Breiter, M. W.

INFLUENCE OF CHEMISORBED CARBON MONOXIDE ON THE OXIDATION OF MOLECULAR HYDROGEN AT SMOOTH PLATINUM IN SULFURIC ACID SOLUTION. *J. Electroanal. Chem., 65(2):623-634, Nov. 10, 1975. 16 refs.*

The effect of chemisorbed carbon monoxide on the oxidation of molecular hydrogen at smooth platinum in sulfuric acid solution was investigated. Potentiostatic current--potential curves of hydrogen oxidation were measured at 0.5 mV/sec on two smooth platinum electrodes of different shape in the presence of various coverages with chemisorbed CO at 0.5 M H2SO4, stirred with molecular hydrogen at 1 cu cm/sec. Carbon monoxide coverages up to 0.6 had a small influence. The

H2 oxidation remained controlled by convective diffusion of molecular H2. Above coverages of 0.6, a kinetic step became increasingly predominant. The effect of chemisorbed CO on the H2 oxidation was similar to that on H2 adsorption, studied previously. The correlation between the rate of the kinetic step and the free energy of hydrogen adsorption in the Temkin model of the surface was established. (Author abstract modified)

61076 APTIC NO. 84094

Brodskaya, B., L. Paalme, and M. Gubergrits

THE USE OF MODEL REACTIONS FOR THE EVALUATION OF THE EFFECT OF AN ELECTRIC DISCHARGE ON A LIQUID. 1. DEGRADATION OF 3,4-BENZO(A)PYRENE IN AQUEOUS SOLUTION DURING A DISCHARGE AT THE PHASE BOUNDARY. *(Primenenie model nykh reaktsii dlya otsenki vozdeistviya elektricheskogo razryada no zhidkost. 1. Degradatsiya 3,4-benzpirena v vodnom rastvore pri razryade na granitse razdela faz). Text in Russian. Izv. Akad. Nauk Est. SSR, Khim. Geol., 24(4):301-303, 1975. 6 refs.*

Kinetic characteristics of the oxidative degradation of 3,4-benzo(a) pyrene (BP) in aqueous solution under the effect of an electric discharge at the gas-liquid phase boundary were studied. The discharge had a voltage of 15 kV and an impact capacity of 0.6 microfarads. The total process of BP degradation was described by a kinetic equation of a second order reaction, the constant rate of which was 3.3 times 10 to the 4th power 1/M sec. The mean rate of BP transformation was 1.2/10 to the minus 6th power M/1 hr at an energy output 6/10 to the minus 5th power molecules/10 eV. The actual release of transformed BP calculated/absorbed energy dose was approximately one order higher. Among the products of BP transformation were a mixture of 5,8- and 5,10-quinones, known to have no carcinogenic properties. Part of the products were insoluble in water.

61077 APTIC NO. 75961

Broida, H. P., Jay D. Eversole, and Paul K. Hansma

STUDIES OF SMALL METALLIC PARTICLES FORMED BY HOMOGENEOUS NUCLEATION: LIGHT SCATTERING AND ELECTRON MICROSCOPY (FINAL REPORT). *California Univ., Santa Barbara, Dept. of Physics, Environmental Protection Agency Grant R-800845, Proj. 21AJX-004, Program Element 1AA008, Rept. EPA-650/3-75-006, 45p., Feb. 1975. 24 refs.*

NTIS: PB 244403/AS

The formation of metallic particles ranging from 5-5000 nm in diameter by homogeneous nucleation from the vapor phase was studied using light scattering and electron microscopy. Metals used in the experiments included: sodium, potassium, lithium, rubidium, cesium, cadmium, magnesium, zinc, and lead. Plasma resonance peaks and widths for alkali metal particles were observed to change systematically with system parameters. The growth of Zn particles was observed with electron microscopy which revealed characteristic geometric shapes. The correlation of these observations may provide information necessary to compute nucleation and growth rates in a steady-state system. (Author abstract modified)

61078 APTIC NO. 83404

Canesson, Paul and Paul Grange

PHOTOELECTRONIC SPECTROSCOPY OF THE MOS2-CO9S8 SYSTEM: STUDY OF HYDRODESULFURIZING CATALYSTS WITH LOW COBALT CONTENT. *(Spectroscopie photo-electronique du systeme MoS2-Co9S8: Etude des catalyseurs d hydrodesulfuration a faible teneur en cobalt). Text in French. C. R. Acad. Sci. (Paris), Serv. C., 281(19):757- 759, Nov. 10, 1975. 7 refs.*

The surface properties of cobalt and molybdenum catalysts were studied. The amorphous masses associating cobalt and molybdenum sulfides, especially those with an atomic content of cobalt inferior to 0.05, were studied with ESCA spectroscopy. Sulfur was mainly in the form of sulfide. Molybdenum presented a complex spectrum attributable to a mixture of Mo(++++) and Mo(+++++) ions. The cobalt ion spectrum could not be obtained. This suggests that the element is not on the surface but rather spread throughout the MoS2 matrix.

61079 APTIC NO. 82627

Carter, J. A., D. L. Donohue, J. C. Franklin, and R. W. Stelzner

ENVIRONMENTAL AND FUEL MATERIALS ANALYSES BY MULTI-ELEMENT ISOTOPE DILUTION SPARK-SOURCE MASS SPECTROMETRY. *Preprint, Missouri Univ., Rolla, 12p., 1975. 7 refs. (Presented at the Trace Substances in Environmental Health, University of Missouri Annual Conference 9th, Columbia, Mo., June 9-12, 1975.)*

The use of dilution spark-source mass spectrometry for the multi-element analysis of metals and organometallics in water and gasoline samples is described. The analysis requires an unequivocal method of equilibration of sample and spike isotopes. The analysis of water samples requires a large (100 ml) sample; and the presence of large amounts of calcium, magnesium, potassium, and organics in water may lead to incorrect concentrations for some elements if careful preparation of the samples is neglected. The detection limit for metallic impurities in water is in the range of 5 times 10 to the -11 g/ml for a 100-milliliter sample, and the accuracy is in the 5-10% range. The detection limits for gasoline are in the 10 to the -10 g/ml range for a 10-milliliter sample, and the precision and accuracy are comparable to those values obtained with water samples. A method of refluxing gasoline with hydrogen chloride solution spiked with isotopically enriched spike elements permits a quantitative analysis with an accuracy of 10% at the 1 microgram/ml level. (Author conclusions modified)

61080 APTIC NO. 83162

Castellano, E. and H. J. Schumacher

PHOTOCHEMICAL DECOMPOSITION OF OZONE AT 3200. *(La descomposicion fotoquimica del ozono a 3200 A). Text in Spanish. An. Asoc. Quim Argent., 63(1):9-15, Feb. 1 75. refs.*

Studies on photochemical decomposition of ozone show that quantum efficiency depends on the wavelength of light and not on temperature or the presence of oxygen and inert gases. Reduction of quantum efficiency was related to deactivation of O(1D) and the high resistance of O2 (1 delta g) and was evaluated at 1 molec/h nu approaching 0.0 for ranges up to 3100 A. The Bausch-Lomb high intensity-monochromator 2 with a 150 watt xenon lamp provided a light band with a maximum of 3200 A. Two series of tests at 25 C (100 mm pure O3; 100 mm pure O3 in presence of 400 mm nitrogen) were performed for comparative analysis of photoabsorption measured by chemical actinometer with Moll thermopile.

61081 APTIC NO. 84032

Chekhov, O. S. and I. N. Yamshchikov

STUDYING THE ABSORPTION OF NITROGEN OXIDES OF PLATES WITH TWO PHASE CONTACT ZONES. *(Issledovanie protsessa absorbtsii okislov azota na tarelkakh s dvumya zonami kontakta faz). Text in Russian. Izv. Akad. Nauk Kaz. SSR, Ser. Khim., no. 5:67-70, Sept.-Oct. 1975. 9 refs.*

The absorption of nitrogen oxides on valve plates with two phase contact zones was studied and compared with the absorption of screen plates. Nitric acid with 12-15% concentration was used as absorbent liquid. The gas pressure was 3.2 atm. The inlet temperature was 100 C, and the outlet temperature 30-40 C. The resistance of valve plates was substantially lower than that of screen plates. Valve plates had higher absorption than screen plates at gas flow rates exceeding 0.28 m/sec.

61082 **APTIC NO. 84345**

Cleveland, William S. and Beat Kleiner

A GRAPHICAL TECHNIQUE FOR ENHANCING SCATTERPLOTS WITH MOVING STATISTICS. *Technometrics, 17(4):447-454, Nov. 1975. 16 refs.*

A graphical technique for enhancing scatterplots with moving statistics is described and applied to a problem involving ozone transport from an urban complex. The technique enhances the information on scatterplots by plotting three smooth curves of moving statistics which summarize the change in the distribution of a dependent variable given an independent variable. The three curves involve the use of the midmean (the average of all observations between the quartiles) and two new statistics, viz., the lower semi-midmean (the midmean of all observations below the median) and the upper semi-midmean (the midmean of all observations above the median). The technique is used for an analysis of air pollution data to show that emissions of primary pollutants in the Camden-Philadelphia urban complex are partly responsible for high ozone concentrations 37 km to the southeast in Ancora, New Jersey, a nonurban area, where concentrations of primary pollutants are low but where ozone daily maxima frequently exceed the Federal standard. (Author abstract modified)

61083 **APTIC NO. 83339**

Crecelius, Hans-Joachim and Walter Forwerg

SORPTION OF ORGANIC COMPOUNDS ON SILICA GEL FOR EMISSION MEASUREMENT. *(Die Sorption organischer Vergindungen an Silikagel zur Bestimmung von Emissionen). Text in German. Staub, Reinhaltung Luft, 35(9):330-335, Sept. 1975. 9 refs.*

The determination of the retention volumes of organic compounds and the study of the retention volumes as a function of the process parameters provides information on the sorption capacities of silica gel. The retention volume of benzene was investigated as a function of the humidity of the sample, the concentration of the test components, the layer thickness of the gel in the sampling tube, the desorption temperature, and the number of desorptions/sampling tube. There is a functional relationship between retention volume and the boiling point of the organic compounds which permits a rough estimate to be made of the retention volumes of other organic compounds under certain conditions, such as comparable polarity.

61084 **APTIC NO. 76428**

Culick, F. E. C.

STABILITY OF THREE-DIMENSIONAL MOTIONS IN A COMBUSTION CHAMBER. *Combust. Sci. Technol., 10(3-4):109-124, 1975. 10 refs.*

The problem of linearized three dimensional motions in a nonuniform flowfield is examined. Several modifications of the general analysis are effected. The influence of particulate matter is accounted for, to zeroth order, and certain boundary processes treated in earlier one dimensional computations are accommodated. The results are applied to a problem of linear stability in solid propellant rocket motors. (Author abstract)

61085 **APTIC NO. 80303**

Deleanu, Liliana and J. A. D. Stockdale

DISSOCIATIVE IONIZATION OF MOLECULES BY ELECTRON IMPACT. II. KINETIC ENERGY AND ANGULAR DISTRIBUTIONS OF N+ AND N++ IONS FROM N2. *J. Chem. Phys., 63(9):3898-3906, Nov. 1, 1975. 23 refs.*

An apparatus containing crossed molecular and pulsed electron beams was used to obtain distributions in kinetic energy and angle of fast (greater than 1.5 eV) nitrogen+ and N++ ions produced through dissociative ionization of N2 by impact of electrons with energies from threshold to 300 eV. Previously unreported structure is found in both N+ and N++ kinetic energy spectra. The angular distributions of N+ (energy resolved) and N++ (total) ions are substantially isotropic for abstract)

61086 **APTIC NO. 83407**

Demerjian, Kenneth L. and Kenneth L. Schere

A COMPUTER PROGRAM FOR GENERATING THE DIURNAL VARIATION OF PHOTOLYTIC RATE CONSTANTS FOR ATMOSPHERIC POLLUTANTS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Meteorology and Assessment Div., 4p., 1975. 22 refs. (Presented at the Environmental Sensing Assessment Conference, Las Vegas, Nev., Sept. 14-19, 1975.)*

A computer program for generating the diurnal variation of the photolytic rate constants for nitrogen dioxide, ozone, nitrous acid, nitric acid, formaldehyde, acetaldehyde, hydrogen peroxide, and nitrous oxide in the lower atmosphere from inputs of latitude, longitude, data, and local standard time is described. Theoretical rate constant values for the photodissociation of NO2 in the atmosphere are derived using the program and are 15-20% higher than those observed experimentally. A review of the weather record for the particular day on which the observed values were obtained suggests that cloud conditions are perhaps responsible for the majority of differences reported.

61087 **APTIC NO. 83923**

Denig, Fred

THE USE OF OXYGEN ENRICHED AIR WHEN INCINERATING MUNICIPAL GARBAGE AND REFUSE OR OTHER LOW GRADE FUELS. *Brielle, N. J. Convers. Refuse Energy Int. Conf., Tech. Exhib., 1st, Montreux, Switzerland, 1975, p. 439-445. 1 ref. (Nov. 3-5.)*

The use of oxygen-enriched air to incinerate municipal garbage and refuse or other low grade fuels is discussed. Cellulose is used as the basic fuel because many other constituents of refuse have chemical compositions close to cellulose. Equations with ratios for various O2-nitrogen mixtures were developed. Six conditions or ratios including pure O2 with a ratio of one were examined. The U. S. ton of 2000 lb was used as the unit of weight. With a ratio of R equals 3, the manufactured O2 demand was 922 ton/day fuel consumption of 1640 ton of dry ash-free fuel, or 0.586 ton manufactured O2/ton of ash moisture-free fuel (cellulose).

61088 **APTIC NO. 80273**

Dimmick, R. L., Alvin Boyd, and H. Wolochow

A SIMPLE METHOD FOR ESTIMATION OF COAGULATION EFFICIENCY IN MIXED AEROSOLS. *Preprint, California Univ., Berkeley, School of Public Health and Naval Supply Center, Oakland, Calif., Naval Biomedical Research Lab., 8p., 1975.*

Two aerosols of particles that can react to form a photoreducible compound can be used to measure coagulation efficiency. The system used consisted of mixed aerosols of silver nitrate (2%) and potassium bromide (2%) conducted through a glass tube and irradiated by an incandescent lamp prior to collection in the dark in distilled water in impingers. The procedure to establish standards was to operate both atomizers simultaneously, collect the output in water, add photographic developer, allow the impinger to reamin in the light for 15 min, add fixative, and determine the opitcal density at 640 nm. To estimate coagulation efficiency, the mixed aerosols were collected in a darkened room. Only silver cations that had contacted bromine anions in the lighted tube would form silver after development. Coagulation efficiency was less than 5% without the orifice. When the orifice was inserted, values of coagulation were between 15 and 21%. Suggestions for improving the method are included. This method measures only the A-B coagulation fraction, which is only half the total coagulation in the mixed aerosols containing A-A and B-B fractions.

61089 APTIC NO. 82468

Dodge, Marcia C. and Thomas A. Hecht

OZONE DECAY IN IRRADIATED SMOG CHAMBERS. Environ. Letters, 10(3):257-263, 1975. 12 refs.

The rate of ozone decay in the dark and in illuminated smog chambers was measured. The half-life of O3 in the dark depended on both the surface to volume ratio and the surface material of the chamber. The O3 disappeared significantly faster under irradiation than in the dark. A computer simulation was used to explain the phenomenon in terms of a series of chemical reactions involving O3, O(1D), water, hydroxide, hydroperoxy radical, and ultraviolet light. (Author abstract modified)

61090 APTIC NO. 83532

Dollimore, David, Andrew Galwey, and Graham Rickett

NO. 153 -- ABSORPTION AND REACTIVITY OF SOME SULPHUR-CONTAINING COMPOUNDS ON A MIXED-OXIDE COBALT MOLYBDATE TYPE CATALYST. *J. Chim. Phys., 72(9):1059-1064, Sept. 1975. 23 refs.*

Adsorption-desorption isotherms for hydrogen sulfide, dimethyl sulfide, ethanethiol, and thiophene on a cobalt oxide-molybdenum oxide-gamma-alumina catalyst are reported. The adsorption of dimethyl sulfide and thiophene was interpreted as physical adsorption only. Isosteric heats of thiophene adsorption at various coverages were between 48.5-34.7 kJ/mol. Catalyst pore size distributions, calculated from this data by the Kelvin equation, are reported. Appreciable amounts of H2S and of ethanethiol were retained on the surface even after prolonged outgassing. These quantities of chemisorbed gas were used to estimate the number of active sites on the catalyst surfaces. A quantitative kinetic study of the thermal decomposition of adsorbed ethanethiol was made. (Author abstract modified)

61091 APTIC NO. 76283

Donovan, T. E. and R. Greif

LAMINAR CONVECTION WITH AN ABSORBING AND EMITTING GAS. *Appl. Sci. Res., 31(2):110-122, Aug. 1975. 15 refs.*

The heat transfer and fluid flow are determined for fully developed laminar flow in a vertical channel. The effects of natural and forced convection and thermal radiation are included in the analysis. The spectral variation of the radiation properties are included through the use of the total band absorbance. The analysis is general and specific numerical results are obtained for the 15 micron band of carbon dioxide. A simplified approach for large path is presented which is in excellent agreement with the more exact results. (Author abstract modified)

61092 APTIC NO. 79759

Drake, Elisabeth M. and Robert C. Reid

HOW LNG BOILS ON SOILS. *Hydrocarbon Process, 54(5):191-194, May 1975. 9 refs.*

The boiling rates of liquid nitrogen gas (LNG) on soil are discussed. The LNG boiling rates are critical in determining the potential hazard that can result from LNG spills. Such rates are dependent on the surface onto which the LNG is spilled and control the extent of the hazard, all other variables assumed constant. Methods for predicting downwind vapor dispersion are available and potential hazard estimates can be made if spill rates, impoundment geometries, boiling rates, and atmospheric conditions are specified. Boiling rates of LNG on compacted soils are influenced significantly by soil type, moisture content, and LNG composition. Rain, humidity, and disturbance of the initially compacted soil have significant effects on boiling rates in the event of spill. Dikes finished with crushed rock or stone yield much higher vaporization rates than compacted soil dikes because of easy percolation and high surface area of rock per unit floor area.

61093 APTIC NO. 80485

Dullien, F. A. L.

SINGLE PHASE FLOW THROUGH POROUS MEDIA AND PORE STRUCTURE. *Chem. Eng. J. (Netherlands), 10(1):1-34, Aug. 1975. 99 refs.*

The characteristics of the flow of gases through a porous medium are discussed. Gases tend to adsorb on the pore surface and the permeabilities measured with highly adsorbing gases greatly exceed the permeabilities determined with non-adsorbing gases or with liquids. The excess permeability is attributed to surface diffusion or surface flow in the adsorbed phase. Compressibility is an important contributing factor responsible for the occurrence of unsteady state gas flow in porous media, which necessitates elaborate numerical calculations to predict the flow history. The velocity at the solid walls cannot be considered zero. The slip or drift velocity at the wall must be taken into account. This effect is significant when the mean free path of the gas molecules is comparable in magnitude to the pore size. When the mean free path is much less than the pore size, the slip velocity becomes negligibly small.

61094 APTIC NO. 76522

Dupre-Maquaire, J. and P. Pinson

EMISSION SPECTRUM OF N2O IN THE 8 MICRON RANGE. *J. Mol. Spectr., 58(2):239-249, Nov. 1975. 17 refs.*

High resolution spectra of nitrous oxide excited by a direct current discharge in the 8 micron range were observed with an interferential grating spectrometer. Nearly 1800 lines were observed, and for the well separated ones, the wavenumber accuracy goes up to approximately 0.003/cm. The vibrational rotational constants were obtained by a least squares calculation on a computer. To obtain maximum accuracy of these constants, simultaneous analysis was performed using the wavenumbers of all the transitions observed in the 2.9, 4.7, and 8 micron range, for sigma, pi, delta, and phi levels.

61095 APTIC NO. 76096

Durbin, Paul A., Thomas A. Hecht, and Gary Z. Whitten

MATHEMATICAL MODELING OF SIMULATED PHOTOCHEMICAL SMOG (FINAL REPORT). *Systems Applications, Inc., San Rafael, Calif., Environmental Protection Agency Contract 68-02-0580, Program Element 1A1008, ROAP 21AKC-23, Rept. EPA-650/4-75-026, EF75-62, 169p., June 1975. 81 refs.*

NTIS: PB 246122/AS

A kinetic mechanism for photochemical smog formation is developed and validated using smog chamber data. Mechanisms are developed for the following systems: propylene-nitrogen oxides, butane-NOx, propylene-sulfur dioxide-NOx, and toluene-NOx. Smog chamber effects involving photolysis and surface reactions are demonstrated to potentially play a critical role in such experiments. The application of kinetic simulation to the study of hydrocarbon reactivity and ozone production in smog systems is also discussed. (Author abstract modified)

61096 APTIC NO. 80307

Dutton, J., F. M. Harris, and D. B. Hughes

ION-MOLECULE REACTIONS AND THE ELECTRICAL BREAKDOWN OF MIXTURES OF NITROUS OXIDE AND OXYGEN. *J. Phys. D., 8(14):1640-1646, Oct. 1, 1975. 14 refs.*

Measurements of the spatial growth of prebreakdown ionization currents in uniform electric fields have been made in mixtures of nitrous oxide and oxygen. The ratio of effective primary ionization coefficient to total gas number density was found to decrease as the oxygen concentration in the mixture increased up to about 10%. This is explained in terms of the suppression of collisional detachment from negative nitric oxide ion by the competing reaction in which NO- ions change identify in collisions with O2 molecules. Measurements of the breakdown voltage of mixtures with oxygen concentrations up to about 10%, showed that, as expected from the observed dependence of the ratio of effective primary ionization coefficient to total gas number density on oxygen concentration, the dielectric strength of the mixtures increased above that of N2O alone, even though oxygen is a much weaker dielectric than N2O. (Author abstract)

61097 **APTIC NO. 82643**

Edwards, H. W., R. J. Rosenvold, and H. G. Wheat

SORPTION OF ORGANIC LEAD VAPOR ON ATMOSPHERIC DUST PARTICLES. *Preprint, Colorado State Univ., Fort Collins, Dept. of Mechanical Engineering, 18p., 1975. 20 refs. (Presented at the Trace Substances in Environmental Health, University of Missouri Annual Conference, 9th, Columbia, Mo., June 10-12, 1975.)*

The exposure of simulated atmospheric dust to tetraethyl lead vapor, both in the presence and absence of water vapor, resulted in the sorption of organic lead on the dust particle surfaces, thus providing evidence for the occurrence of a third form of atmospheric lead in addition to inorganic particulate lead and molecular organic lead vapor. At least two forms of sorbed lead were distinguished: one form was readily removed upon heating or by extraction with normal-hexane, and a second form remained after atmospheric aging and perhaps represented a breakdown product. The presence of a trace of sulfur dioxide significantly enhanced the uptake of TEL by the dust particles. Dust particles may thus play a major role in the atmospheric breakdown and scavenging of organic lead. Moreover, the health hazard of organic lead in the presence of particulate matter may be quite different than that normally ascribed to the inhalation of organic lead vapor alone because of the fact that smaller atmospheric particles tend to be more efficient scavengers for organic lead and are likely to be retained in the lungs. (Author abstract modified)

61098 **APTIC NO. 82450**

Eickel, Karl-Heinz

OZONE AS INDICATOR FOR PHOTOCHEMICAL SMOG. *(Ozon als Indikator fuer photochemischen Smog). Text in German. TUE (Tech. Ueberwach.), 16(11):333-335, 1975. 22 refs.*

The mechanism of photochemical smog formation and the possibility of using ozone as an indicator of photochemical smog are discussed. Nitrogen dioxide is decomposed by sunlight into nitric oxide and native oxygen which reacts with molecular oxygen to form ozone. Ozone reacts with NO to form NO2 and with other air pollutants, especially with unsaturated hydrocarbons, to form aldehydes, ketones, alkylnitrates, peroxyacylnitrates, organic acids and peroxy acids. Low-level air pollution by photochemical smog components can be characterized by measurements of the ozone concentrations. However, the use of ozone as an indicator of photochemical smog is complicated by the fact that part of the ozone in the lower layers of the atmosphere originates from higher atmosphere, thus providing for a background concentration (20-40 ppb).

61099 **APTIC NO. 84114**

Fahland, Jochen

RAPID DETERMINATION OF OXYGEN, SILICON, ALUMINUM, BARIUM AND NITROGEN IN RAW BROWN COAL BY ACTIVATION WITH 14 MEV NEUTRONS. *(Schnellbestimmung von Sauerstoff, Silizium, Aluminium, Barium und Stickstoff in Rohbraunkohle durch Aktivierung mit 14-MeV- Neutronen). Text in German. Braunkohle, 27(5):135-139, May 1975.*

The neutron activation method was applied to analysis of 100 gram milled brown coal samples. A Brown-Boveri neutron generator supplied neutrons by the 3H(2H,n)4He reaction at an energy of 14 Mev. Neutron activation of oxygen, silicon, aluminum, barium, and nitrogen produced the short-lived radio-isotopes 16N, 28Al, 24Na, 137Ba, and 13N. Half-lives of these products were 7.14 sec, 2.3 min, 15 hour, 2.6 min, and 10 min, and gamma ray energies of the radioactive products were 6128 kev, 1779 kev, 2754 kev, 662 kev, and 551 kev. The intensity of the gamma rays was measured with a gamma spectrometer having a sodium iodide detector. A sample and a standard were analyzed simultaneously and the gamma ray intensities compared by a computer. Analysis time, including sample preparation (taking the sample, milling and weighing) was as short as 10 min. For Si content alone (important because of the adverse effect of silicon dioxide above 0.1% on coal quality), an analysis could be completed in about 3 min; 30 sec for radiation, 4 sec for sample transport, and 120 sec for gamma spectrometry. In tests of 164 samples of brown coal analyzed by standard methods and by neutron activation, there was close correlation between the two methods in the 0.1-10% concentration range. The average error for a single measurement was + or - 1.4% for 0, + or - 7% for Si, + or - 14% for Al, + or - 6% for N, and + or - 14% for Ba.

61100 **APTIC NO. 80450**

Field, Robert W. and Richard A. Gottscho

OBSERVED AND CALCULATED INTERACTIONS BETWEEN VALENCE STATES OF THE NO MOLECULE. *J. Mol. Spectr., 58(3):394-413, Dec. 1975. 26 refs.*

Observed and calculated interactions between the valence states of the nitric oxide molecule are reported. The first identified valence-valence crossing occurs between the 15nitrogen18oxygen B 2II (v equals 18) b prime 2 delta (v equals 1) levels. No level shifts larger than the detection limit of 0.1/cm were observed at the crossings near J equals 6.5 and J equals 12.5. Two crossings involving higher rotational levels were not examined. Semi-empirical calculations of spin orbit and Coriolis perburbation matrix elements indicated that although the electronic part of the B 2II approximates B prime 2 delta interaction is larger, a small vibrational factor renders the 15N180 B (v equals 18) - B prime (v equals 1) perturbation unobservable. (Author abstract modified)

61101 **APTIC NO. 76268**

Foster, B. P., A. R. Hair, and I. D. Doig

SUSPENSION OF SPHERES IN FULLY DEVELOPED PIPE FLOW. *Chem. Eng. J. (Netherlands), 9(3):241-249, June 1975. 23 refs.*

Teflon spheres ranging in density from 2.10 to 2.13 g/ml and in size from 3.18 to 19 mm were suspended in a section of a vertical tubular riser with a 69.85 mm bore. Reynolds numbers ranged from 2 to 10,000. The particular motion mode adopted is primarily dependent upon the particle Reynolds number with a secondary dependency on the sphere to pipe diameter ratio. Spheres suspended in a fully developed pipe flow adopt a position near the tube axis at particle Reynolds numbers less than 80 but adopt a position near the tube wall at particle Reynolds numbers greater than 200. Drag coefficients for spheres suspended in fully developed pipe flow with particle Reynolds numbers between 2 and 10,000 are greater than those reported for spheres travelling through unbounded quiescent fluids and are dependent upon both the particle Reynolds number and the sphere to pipe diameter ratio. Spheres suspended in fully developed pipe flow oscillate fairly steadily in a radial direction at particle Reynolds numbers between 200 and 10,000. (Author abstract modified)

61102 **APTIC NO. 83526**

Foster, O., J. Besson, A. Cornu, R. Massot, C. Nicotra, and R. Perraud

INTERACTION OF VARIOUS ATMOSPHERIC POLLUTANTS UNDER IRRADIATION. II. ATTEMPTED INTERPRETATION OF THE RESULTS. *(Interaction sous irradiation de divers polluants atmospheriques. II. Essa d* *interpretation des resultats). Text in French. Analusis, 3(9):520-524, Nov. 1975. 16 refs.*

An instrument simulating atmospheric conditions was used to study the interactions of benzene, toluene, xylene, and isobutene with chlorine. Each mixture was exposed to ultraviolet radiation, and samples were analyzed by vapor phase chromatography and mass spectrometry. Neither quantitative nor qualitative changes were observed for benzene, toluene, and xylene exposed to uv radiation without chlorine, while a significant amount of isobutene disappeared for unclear reasons. In the absence of radiation, the mixture of chlorine and each hydrocarbon separately yielded chlorine derivatives. When these mixtures were irradiated, chlorine derivatives were obtained for isobutene and benzene; for toluene and paraxylene, at first oxidized products (aldehydes, acids, phenols) were present, followed after 1-2 hours by the appearance of chlorine derivatives. Chlorine thus seems to act as a sensitizing agent.

61103 **APTIC NO. 78642**

Freund, Samuel M. and Daniel M. Sweger

VINYL CHLORIDE DETECTION USING CARBON MONOXIDE AND CARBON DIOXIDE INFRARED LASERS. *Anal. Chem., 47(6):930-932, May 1975. 33 refs.*

A sensitive, selective detection procedure for vinyl chloride is described based upon Stark modulated absorption of infrared laser radiation. Data are taken by setting the carbon monoxide or carbon dioxide laser to a line with a near coincidence with vinyl chloride, setting the bias voltage on the Stark electrodes to tune the C2H3Cl energy levels to exact coincidence with the laser, and measuring the peak to peak height of the derivative signal, as displayed on an X-Y recorder, corresponding to the resonant absorption of the laser power from a single traversal of the absorption cell. The derivative response occurs as a result of the sine wave modulation applied to the Stark electrodes for the purpose of phase sensitive detection of the resulting signal. The output from the lock in amplifier is fed into a signal averager which permits averaging time constants of from 5-500 sec. Data obtained both CO and CO2 lasers are included.

61104 **APTIC NO. 80181**

Fuller, M. J. and M. E. Warwick

THE CATALYTIC REDUCTION OF NITROUS OXIDE BY CARBON MONOXIDE OVER TIN (IV) OZONE. *J. Catalysis, 39(3):412-418, Sept. 1975. 7 refs.*

The catalytic reduction of nitrous oxide by carbon monoxide over tin (IV) oxide was investigated at 190-220 C using a differential flow reactor. The reaction occurs principally by catalyst redox involving CO chemisorption, carbon dioxide desorption via lattice oxygen abstraction, and reoxidation of the catalyst by nitrous oxide, the last being the rate determining step. The extent of the reduction of SnO2 after attainment of steady state in CO-N2O reactant mixtures can be estimated by monitoring evolved nitrogen during dynamic gas titration of the catalyst with N2O. (Author abstract modified)

61105 **APTIC NO. 80472**

Gaffney, J. S., R. Atkinson, and J. N. Pitts, Jr.

TEMPERATURE DEPENDENCE OF THE RELATIVE RATE CONSTANTS FOR THE REACTION OF O(3P) ATOMS WITH SELECTED OLEFINS, MONOTERPENES, AND UNSATURATED ALDEHYDES. *J. Am. Chem. Soc., 97(22):6481-6483, Oct. 29, 1975. 23 refs.*

Temperature dependence of the relative rate constants for the reaction of oxygen (3P) atoms with selected olefins, monoterpenes, and unsaturated aldehydes was investigated. These compounds were of interest because of their possible significance in the chemistry of polluted atmospheres. Measurements were extended to elevated temperatures (296-423 K) in order to obtain the Arrhenius parameters. The relative rate constants were tabulated for the reactions of O(3P) atoms with propylene, alpha-pinene, beta-pinene, di-limonene, 1-methylcyclohexene, 1,3-cyclohexadiene, acrolein, crotonaldehyde, and toluene.

61106 **APTIC NO. 83037**

Gallagher, P. K., D. W. Johnson, Jr., J. P. Remeika, F. Schrey, L. E. Trimble, E. M. Vogel, and R. J. H. Voorhoeve

THE ACTIVITY OF LA0.7SR0.3MNO3 WITHOUT PT AND LA0.7PB0.3MNO3 WITH VARYING PT CONTENTS FOR THE CATALYTIC OXIDATION OF CO. *Mater, Res. Bull., 10(6):529-538, 1975. 15 refs.*

The carbon monoxide oxidizing activity of a catalyst composed of 0.7 mole of lanthanum, 0.3 mole of strontium, 1 mole of manganese, and 3 mole of oxygen was compared with that of a catalyst composed of 0.7 mole La, 0.3 mole lead, 1 mole Mn, and 3 mole 0 with varying amounts of platinum. La0.7Pb0.3MnO3 and La0.7Sr0.3MnO3 showed comparable catalytic activities for the oxidation of CO to carbon dioxide. However, the former composition was susceptible to deactivation at relatively low temperatures as a result of migration of lead to the surface. This migration was enhanced in single crystals, probably by the presence of borate flux inclusions. The contribution of Pt at levels of 570 ppm or less to the activity of single crystals of La0.7Pb0.3MnO3 was usually small compared with the activity of intrinsic, i.e., freshly prepared and not heated above 400 C, La0.7Pb0.3MnO3 surfaces. The Pt activity became noticeable in deactivated La0.7Pb0.3MnO3. (Author conclusions modified)

61107 **APTIC NO. 72718**

Gay, Bruce W., Jr., Richard C. Noonan, Joseph J. Bufalini, and Philip L. Hanst

PHOTOCHEMICAL SYNTHESIS OF PEROXYACYL NITRATES IN THE GAS PHASE VIA CHLORINE-ALDEHYDE REACTION. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., National Environmental Research Center, 10p., Feb. 1975. 13 refs.*

A new peroxyacyl nitrate synthesis in the gas phase is described. Molecular chlorine is photolyzed to yield chlorine atoms that abstract aldehydic hydrogen fRom an aldehyde. The acyl radical then adds oxygen and nitrogen dioxide to form the PAN. Any member of the PAN family can thus be produced cleanly and in very high yield from its parent aldehyde. (Author abstract modified)

61108 **APTIC NO. 84087**

Gijbels, Peter

ANALYSIS OF THE IDC-CDC WORKING CYCLE. *(Analyse du cycle de travail IDC-CDC). Text in French. Ingenieurs, no. 10:8-10, 12,14,16,18,20, Oct. 1975.*

Three factors characterize the IDC-CDC working cycle. The cycle is based on the thermodynamic assumption that the entropy of a gas remains practically constant when it receives heat during compression. Second, by filling only half of the cylinder, an expansion far greater than the actual compression is obtained, thereby making it possible to obtain more working energy from a cu cm of compressed gas. Third, if combustion takes place during compression, and if both end simultaneously, expansion is maximum and the compressed gases can be spent to extremely low values. The combination of all 3 points produces a motor in which, with weaker injections, it is possible to near total elimination of energy losses (pressure, enthalpy, and entropy), in which the aspired combustion air or the explosive gaseous mixture cool the motor for more than a stroke and a half, and in which the exhaust gases cool the motor for more than a stroke. The fuel vaporizes in the carburetor and the pipes leading to the motor; combined with convections in the pipelines, this leads to a total gasification and a perfect mixing of the explosive gases.

61109 **APTIC NO. 80486**

Gillispie, Gregory D., Ahsan U. Khan, A. C. Wahl, R. P. Hosteny, and M. Krauss

ELECTRONIC STRUCTURE OF NITROGEN DIOXIDE. I. MULTICONFIGURATION SELF-CONSISTENT-FIELD CALCULATION OF THE LOW-LYING ELECTRONIC STATES. *J. Chem. Phys., 63(8):3425-3444, Oct. 15, 1975. 47 refs.*

A basis for an interpretation of the complex absorption spectrum of the nitrogen dioxide molecule was achieved through an extensive ab initio investigation of its electronic structure. Multiconfiguration self-consistent-field wavefunctions were computed for the low lying electronic states of NO2. Significant improvements were made on previous NO2 ab initio calculations in these areas: the double-zeta-plus-polarization quality basis set is larger and more flexible; the treatment of molecular correlation is more extensive; and the electronic energies are calculated for several different bond lengths and bond angles in each state. The computed spectroscopic parameters of the four lowest lying doublet states were found. (Author abstract modified)

61110 **APTIC NO. 76281**

Glanzer, K. and J. Troe

VIBRATIONAL RELAXATION OF NO IN COLLISIONS WITH ATOMIC OXYGEN AND CHLORINE. *J. Chem. Phys., 63(10):4352-4357, Nov. 15, 1975. 43 refs.*

The vibrational relaxation of nitric oxide (X sq Pi) in the v equals 0, 1, and 2 states in collision with argon, NO, nitrogen dioxide, and electronic ground state oxygen and chlorine atoms was studied in shock waves. Oxygen and Cl atoms were produced in the thermal dissociation of NO2 or nitrous oxide at 2700 K, and of ClNO at 1700 K, respectively. Both atoms were very efficient catalysts for vibrational energy transfer of NO. The relaxation rates observed suggest a mechanism involving both (NO2) asterisk and (ClNO) asterisk collision complexes. (Author abstract modified)

61111 **APTIC NO. 76352**

Glasson, William A.

METHOXYL RADICAL REACTIONS IN ATMOSPHERIC CHEMISTRY. *Environ. Sci. Technol., 9(12):1048-1053, Nov. 1975. 19 refs.*

The photolysis of methyl nitrite, as a source of methoxyl radicals, was investigated under various conditions of oxygen, nitric oxide, and nitrogen dioxide concentration. Emphasis is placed on the chemistry occurring in air in order to determine how methoxyl radicals could take part in photochemical smog formation. The fate of CH3O in air is primarily oxidation to formaldehyde, which serves as a secondary free radical source, and to HO2 which oxidizes NO to NO2. The CH3O chemistry plays an important role in photochemical smog formation. (Author abstract modified)

61112 **APTIC NO. 84189**

Goto, Yoshiyuki and Kenkoku Azuma

REACTION BETWEEN NOX AND OZONE. *(NOx to ozon tono hanno ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):274, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 11.)*

Nitric oxide and ozone were separately mixed with nitrogen gas with and without moisture, and heated in a heating bath, then mixed in a mixing cell for less than 0.2 sec. The reacted gas was then analyzed for nitrogen oxides and ozone concentrations by the chemiluminescence and ultraviolet methods. The infrared absorption was also measured for the reacted gas. In the reaction of the dry system, the decrease of the NO concentration and the formation of nitrogen dioxide were observed and they were compared to the amount of ozone addition to the reaction system. The IR spectra showed the formation of nitrogen pentoxide for the dry system. In the reaction of the wet system, no nitrogen dioxide formation corresponding to a decreased amount of NO was detected by the NOx meter. The IR spectra showed the formation of nitric acid after the formation of nitrogen pentoxide.

61113 **APTIC NO. 76003**

Heicklen, J. P., E. Sanhueza, I. C. Hisatsune, R. K. M. Jayanty, R. Simonaitis, L. A. Hull, C. W. Blume, and E. Mathias

OXIDATION OF HALOCARBONS (FINAL REPORT). *Pennsylvania State Univ., University Park, Center for Air Environment Studies, Environmental Protection Agency Grant 800949, Program Element 1A1008, ROAP 26AAD-20, Rept. EPA-650/3-75-008, 152p., May 1975. 150 refs.*

NTIS: PB 245153/AS

The gas-phase, room-temperature oxidation of haloethylenes was investigated. The oxidation was performed in five ways: chlorine atom initiation, mercury sensitization, reaction with atomic oxygen, reaction with atomic oxygen in the presence of molecular oxygen, and reaction with ozone. The major products were the corresponding carbonyl chlorides containing one or two carbon atoms in the first four systems, with the reactions proceeding via a long-chain free radical process. A diradical chain was involved in the ozone oxidation reaction which is inhibited by O2. Free radical attack of dichloromethane or methyl chloride in the presence of O2 give carbonyl halides as did the photolysis of carbon tetrachloride, tricholorfluoromethane, and dichlorodifluoromethane in the presence of O2 or O3. Carbon tetrachloride and the chlorofluoromethanes reacted with atomic oxygen via chlorine atom abstraction in reactions with large rate coefficients which were nearly proportional to the number of chlorine atoms in the chlorofluoromethane. (Author abstract modified)

61114 **APTIC NO. 80462**

Hillbrath, H. S., W. P. Dill, and W. A. Wacker

THE CHOKING PRESSURE RATIO OF A CRITICAL FLOW VENTURI. *J. Eng. Ind., 97(4):1251-1256, Nov. 1975. 19 refs. (Presented at the American Society of Mechanical Engineers, Annual Meeting, Winter, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/FM-7.)*

The optimization of diffusers for critical flow venturi is discussed and suggestions for designs practice are presented. Test results are given for six different diffuser configurations and a comparison is made with data on 11 configurations from other investigators. For the small divergence angles considered, a simply defined diffuser effectiveness parameter is approximately independent of flow conditions and may be used to predict choking pressure ratio. Even very short diffusers greatly improve performance, and for longer diffusers, critical flow can be maintained at total pressure losses of 5%. (Author abstract modified)

61115 **APTIC NO. 76323**

Hunt, Donald F. and T. Michael Harvey

NITRIC OXIDE CHEMICAL IONIZATION MASS SPECTRA OF OLEFINS. *Anal. Chem., 47(13):2136-2141, Nov. 1975. 28 refs.*

The use of nitric oxide as a reagent gas for obtaining chemical ionization mass spectra of olefins was investigated. Electron bombardment of nitric oxide at 1 torr affords reagent ions at m/e 30(NO+) and 60 (NO NO)+. These ions react with internal olefins and dienes to produce spectra containing ions corresponding to (M + NO)+, M+, and (M - 1)+. For most samples these ions carry 70-90% of the total ion current. Terminal olefins undergo reactions with NO+ to form the same three ions plus a novel series of fragments derived from the Markownikoff addition of NO+ to the olefin linkage. Ions characteristic of sample molecular weight constitute 30-60% of the total sample ion current in the chlorine (NO) spectra of terminal olefins. Mechanisms, energetics, and analytical applications of the ion-molecule chemistry of NO^+ with alkenes are discussed. (Author abstract)

61116 **APTIC NO. 72449**

Iinuma, Kazuo

POLLUTANT EMISSION MECHANISM. *(Osen bushitsu no hassei kiko). Text in Japanese. Kagaku Kojo (Chem. Factory), 19(2):17-20, Feb. 1975.*

The formation mechanisms of atmospheric pollutants, soot, hydrocarbons, carbon monoxide, sulfur oxides, and nitrogen oxides emitted by industrial combustion are reviewed. Liquid and gaseous fuels consisting primarily of HC are most commonly used. The variation in combustion gas composition with temperature in the case of combustion of methane-air mixture at atmospheric pressure indicates the formation of fairly large amounts of dissociation products, intermediate products of combustion, and nitrogen dioxide at high temperature. The physical and chemical properties and formation conditions of soot are reviewed in reference to fuel type and properties. The formation conditions of HC, CO, SO_x and NO_x (prompt nitric oxide and fuel NO) are reviewed in reference to combustion conditions and combustion mechanisms.

61117 **APTIC NO. 84177**

Imai, Toru, Tadao Suzuki, Yasuo Sueyoshi, and Masanori Matuno

PHOTOCHEMICAL REACTION IN THE MIXTURE OF NOX AND HYDROCARBONS, PART 1. *(Chisso sankabutsu-tankasuiso kongokei ni okeru kokagaku hanno, 1). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):266, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 3.)*

The photochemical reaction of 15 aromatic hydrocarbons with propylene was studied in a smog chamber. Individual aromatic hydrocarbons and propylene were added to a 2 cu m chamber in 1 to 1 ratio together with 0.3 ppm nitrogen oxides, and irradiated at 30 C. The decrease in the depletion rate of total hydrocarbons became smaller with the addition of propylene, and it became larger with increased ozone maximum and aldehyde concentrations. The reactivity of aromatic hydrocarbons increased with the addition of propylene.

61118 **APTIC NO. 84030**

Ione, K. G., N. N. Bobrov, and A. A. Davydov

CATALYTIC ACTIVITY OF NICKEL OXIDES OF DIFFERENT GRAIN SIZES. *(Kataliticheskaya aktivnost okisnykh soedineniy nikelya razlichnoy dispersnosti). Text in Russian. Kinetika i Kataliz, 16(5):1234-1240, 1975. 15 refs.*

The catalytic activity of nickel oxide of different grain sizes for waste gases with 1-5% carbon monoxide was studied. The atomic catalytic activity and the activation energy of the CO oxidation reaction were strongly dependent on the dispersity of both massive NiO and of NiO applied on silica and on zeolites. The catalytic activity was lowest for isolated cations in zeolites, and highest for strongly interacting cations in zeolites and highly dispersed NiO. High activation energy of the reaction was observed with all highly dispersed NiO preparations at temperatures below 250 C, which reached first at 350 C with NiO with low degree of dispersity. The atomic catalytic activity increased by 150% as the specific surface was increased from 1-40 sq m/g to 100 sq m/g.

61119 **APTIC NO. 80463**

Jackels, Charles F. and Ernest R. Davidson

CONFIGURATION INTERACTION STUDY OF THE GROUND STATE MOLECULAR PROPERTIES OF NO2. *J. Chem. Phys., 63(11):4672-4677, Dec. 1, 1975. 22 refs.*

An ab initio SCF-Ci wavefunction for the 2A1 ground state of nitrogen dioxide was calculated using a double zeta plus polarization quality basis set. The CI energy, -204.374346 a.u., is the lowest which has been reported for this molecule. The CI wavefunction is discussed and Mulliken population analyses are presented. Several one electron properties, including the magnetic hyperfine splitting parameters, are reported for both the SCF and Ci wavefunction. (Author abstract modified)

61120 **APTIC NO. 83563**

Jaroniec, M.

ADSORPTION OF GAS MIXTURES ON HETEROGENEOUS SURFACES. ANALYTICAL SOLUTION OF INTEGRAL EQUATION FOR JOVANOVIC ADSORPTION ISOTHERM. *J. Colloid Interface Sci., 53(3):422-428, Dec. 1975. 26 refs.*

New adsorption isotherms for binary gas mixtures on heterogeneous surfaces were obtained by using the generalized integral equation for the overall adsorption isotherm. The isotherms were derived from certain arbitrary but solvable energy distribution functions if the Javanovic mixed isotherm represents the individual homotattic sites. From mathematical analysis of the generalized integral equation, it follows that the mixed Jovanovic equation used as the local adsorption isotherm is most convenient with regard to analytical and numerical calculations. (Author abstract)

61121 **APTIC NO. 76019**

Jeffries, Harvey, Donald Fox, and Richard Kamens

OUTDOOR SMOG CHAMBER STUDIES. EFFECT OF HYDROCARBON REDUCTION ON NITROGEN DIOXIDE (INTERIM REPORT). *North Carolina Univ., Chapel Hill, Dept. of Environmental Sciences and Engineering, Environmental Protection Agency Grant 800916, Program Element 1AA008, ROAP 21AZJ-008, Rept. EPA-650/3-75-011, 222p., June 1975. 39 refs.*

NTIS: PB 245829/AS

The effect of hydrocarbon reduction on nitrogen dioxide concentration was studied in a 312-cubic meter Teflon film outdoor smog chamber operating under natural conditions of solar radiation, temperature, and relative humidity. The performance of the system was assessed during 92 12-hour runs using propylene and nitrogen oxides. Good agreement was found between the outdoor chamber s results and those previously observed for indoor smog chambers. A simulated urban hydrocarbon mix and NO_x were used to evaluate the effect of hydrocarbon reduction on NO_2 concentration during 130 12-hour runs. Overall, for initial non-methane hydrocarbon and NO_x levels similar to those typically present in current urban atmospheres, reduction of the hydrocarbon concentration by 60-90% resulted in a 20-35% reduction in both NO_2 dosage and maximum NO_2 concentration. Slow dilution of relatively reactive propylene/NO_x systems led to lower NO_2 and ozone maximum concentrations than occurred in the same undiluted chemical system. Dilution of lower reactivity hydrocarbon mix/NO_x systems led to lower NO_2 concentrations but higher ozone concentrations than occurred in the same system without dilution. (Author abstract modified)

61122 **APTIC NO. 82399**

Jellinek, H. H. G. and K. Takada

TOXIC GAS EVOLUTION FROM POLYMERS: EVOLUTION OF HYDROGEN CYANIDE FROM LINEAR POLYURETHANE. *J. Polymer Sci., 13(12):2709-2723, Dec. 1975. 17 refs.*

Hydrogen cyanide evolution from linear polyurethane was studied over a range of temperatures from 261 to 480 C as a function of exposure time, oxygen pressure, film thickness, and chain length. Infrared spectra were also measured as a function of exposure time. Gas evolution during thermal degradation in vacuo was investigated in a quartz spoon reaction ves-

sel. Rate constants and energies of activation were evaluated for all reactions. Gas evolution and adsorption were diffusion-controlled during thermal and thermal-oxidative degradation up to at least 330 C. Thermal degradation consisted essentially of a reversal of the polycondensation process. The thermal-oxidative degradation was a complicated reaction involving chain scission, crosslinking, carbonization, and gas evolution. Hydrogen cyanide evolution, although appreciable, was only a minor side reaction of the total oxidation process. A tentative mechanism for HCN evolution was proposed. (Author abstract)

61123 APTIC NO. 73900

Kagiya, Tsutomu, Katsuo Takemoto, and Yoshikimi Uyama

PROMOTIONAL OXIDATION DEGRADATION METHOD FOR AIR POLLUTANTS USING ARTIFICIAL PHOTOCHEMICAL PROCESS. *(Jinko kokagaku ho ni yoru taiki osen bushitsu no sokushin teki sanka bunkai ho). Text in Japanese. Preprint, Japan Chemical Spociety, Tokyo, p. 784, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1036.)*

The decomposition rates of photochemical oxidation of propane, toluene, methanol, carbon monoxide, chloroform, tetrachloroethylene, pyridine, acetonitrile, nitric oxide, dimethyl disulfide, and sulfur dioxide by mercury lamps with different HG pressures were measured with and without the presence of 2000 ppm chloride gas in the same reaction cell. The concentration ranges for the compounds used were 300 to 2000 ppm and experiments were conducted under water saturated air atmosphere. The decomposition rates were determined by gas chromatography. The photochemical oxidation of the compounds was strengthened by the presence of chlorine gas, and even the decomposition of tetrachloroethylene or other compounds with unsaturated bonds showed a marked increase with Cl2 presence. The decomposition rate in %/sec of toluene, CO, acetonitrile, NO, and SO2 with and without (shown in parenthesis) Cl2 presence was 0.26 (0), 8.33 (0.07), 1.32 (0), 6.40 (3.33), and 3.83 (2.16), respectively. The wavelengths of irradiating ultraviolet light also affected the decomposition rate and the shorter wavelength increased the decomposition rate of all compounds. The effect on vinyl chloride photochemical decomposition of the presence of Cl2, sulfur dichloride, thionyl chloride, trichloroethylene, and tetrachloroethylene was also studied, and the VC decomposition rate in %/sec by these compounds was 2.4, 5.0, 38, 17, and 13 respectively, while the decomposition rate of VC by itself with light was 0.3 %/sec.

61124 APTIC NO. 82195

Kagiya, Tsutomu, Yoshikimi Uyama, and Katsuo Takemoto

ACCELERATED REDUCTION DECOMPOSITION METHOD OF NITROGEN OXIDES BY ULTRAVIOLET RAYS. *(Shigaisen ni yoru chisso sankabutsu no sokushinteki kangen bunkaiho). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 37, 1975. (Presented at the Japan Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975.)*

The nitrogen oxides reduction reaction by the addition of a second compound was studied with ultraviolet radiation. The reaction was tried in reaction tube atmospheres of both air and nitrogen. To a reaction tube containing 150 ppm nitric oxide, a second compound was added, which was then irradiated by a mercury lamp for 5 min. After the irradiation, the gas composition in the reaction tube was analyzed by gas chromatography. The added compounds were ammonia, sulfur dioxide, carbon monoxide, hydrogen, methane, ethylene, butadiene, and methanol. The reduction of NO and nitrogen dioxide occurred with the addition of ammonia, sulfur dioxide, ethylene, butadiene, and methanol; however CO, hydrogen, and methane did not induce the NOx reduction reaction. The addition of ammonia was not effective for the NOx reduction reaction. The NO reduction rate increased with increased amounts of ammonia. With an ammonia/NOx mole ratio in the reaction tube greater than 2, 90% of added NO disappeared from the system. The effect of wavelength on the NOx reduction reaction was also examined by using lamps with different mercury pressures. The lower mecury pressure lamp gave greater NOx reduction than the higher mercury pressure lamp.

61125 APTIC NO. 83195

Kagiya, Tsutomu, Katsuo Takemoto, and Wataru Kawazoe

DECOMPOSITION BY ULTRAVIOLET RAYS OF ATMOSPHERIC FLUOROCARBONS. *(Kuki chu ni fukumareru furuorokabon-rui no shigaisen bunkaisei). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 42, 1975. 2 refs. (Presented at the Japanese Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D19.)*

The decomposition of fluorocarbons (difluorochloromethane, difluorodichloromethane, trifluorochloromethane, trifluorobromomethane, difluorochlorobromomethane, difluoroethane, trifluoroethane, and tetrafluoroethane) by ultraviolet radiation in the presence of ozone (O3) was studied under laboratory conditions. Air containing 1000 ppm of fluorocarbon was irradiated with a mercury lamp (high pressure H, low pressure L, extremely low pressure S), and reactions were allowed to occur at room temperature. No decomposition occurred for CClF3 at H, L, and S. Except for CBrF3 and CBrClF2, the initial decomposition rate was lowest at H, highest at S, with L in-between. Initial decomposition rates (%/sec) for the fluorocarbons were as follows (H, L, S): CHClF2 (0.005, 0.009, 0.187); CCl2F2 (0.009, 0.050, 0.073); CClF3 (0.000); CBrF3 (0.044, 0.033, 0.087); CBrClF2 (0.187, 0.050, 0.067); C2H2F2 (0.075, 0.547, 0.978); C2ClF3 (8.65, 16.1, 19.4); C2F4 (0.103, 0.987, 2.67). When ultraviolet irradiation was conducted at S in the presence of O3, the decomposition rate of CCl2F2 did not change in the presence of O3, but the initial decomposition rate of O3 was about 3 times greater when CCl2F2 was present. In the C2ClF2-O3 system, rates for both O3 and C2ClF3 decreased markedly.

61126 APTIC NO. 73318

Katagiri, Y. and T. Ohashi

PHOTOCHEMICAL REACTIONS OF HYDROCARBONS IN SMOG CHAMBER. *(Smog chanba ni yoru tankasuiso no kokagaku hanno). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 6:47, Feb. 1975.*

The photochemical reactivity of typical aliphatic and aromatic hydrocarbons was studied using a 6.64 cu m smog chamber and ultraviolet lamp. Each hydrocarbon in the smog chamber was adjusted to 2 ppm and was then reacted with 1 ppm nitric oxide for 4 hr under UV light. The reactivity of each hydrocarbon was determined by measuring the decreased amount of nitric oxide and the amount of ozone formation in each reaction system. The NO decreasing coefficient and O3 formation coefficient found were, in decreasing order, propylene, o-xylene, toluene, cyclohexane, n-hexane, and benzene.

61127 APTIC NO. 84624

Kato, Tatsuo and Yoshimichi Hanai

SURVEY OF THE CAUSE OF PHOTOCHEMICAL SMOG REP. 8. *(Kokagaku sumogu genin no chosa kenkyu, 8). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):622, 1975. (Presented at Japan. Soc. of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 354.)*

The gas phase photochemical reaction between hydrocarbons, nitric oxide, and oxygen was studied. The hydrocarbons studied were toluene, ethyl benzene, n-propyl benzene, and o-, m-, and p-toluene. The reaction was induced by one to 5 hr of irradiation with ultraviolet light at 30 C. The reaction products were concentrated by a liquid oxygen cold trapping method, and analyzed by gas chromatography-mass spectrometry. The reaction products identified were benzaldehyde, triarylaldehyde, acetophenone, ethyl phenyl ketone, nitrotoluene, and nitroxylene. Nitrophenols were produced and adhered tightly to the reaction vessel. In the toluene reaction, 2 nitro-o-cresol and 2 nitro-p-cresol could also be identified. The formation of the intermediate products in the process of nitrophenol production was also investigated, and only ethyl phenol was detected in small amounts.

61128 APTIC NO. 79591

Kenney, C. N.

MOLTEN SALT CATALYSIS OF GAS REACTIONS. *Catal. Rev., Sci. Eng., 11(2):197-224, 1975. 120 refs.*

Studies on the catalysis of gas reactions by molten salts are summarized. Emphasis is placed on melts based on K2S207, copper chloride, zinc chloride, and aluminum chloride. The specific reactions catalyzed by these salts are condensation, cracking, and isomerization; halogenation, and oxychlorination including the Deacon reaction and dehydrochlorination reactions; oxidation reactions including the oxidation of sulfur dioxide to sulfur trioxide and organic compounds; and miscellaneous reactions. The chemical kinetics of these reactions is stressed.

61129 APTIC NO. 80335

Kerker, Milton

LABORATORY GENERATION OF AEROSOLS. *Ad. Colloid Interface Sci., 5(2):105-172, Nov. 1975. 114 refs.*

Laboratory methods for preparation of aerosols are reviewed. Condensation generators are based upon controlled cooling of vapors and condensation nuclei in a flowing system. Aerosols comprised of solid particles are prepared by similar techniques. These particles consist of salts, metals, polymers, or oil-coated salts. Solid particles formed by quenching hot vapors are usually spherical and amorphous. A variety of metal oxide aerosols are formed by burning metal chlorides and oxychlorides in specially designed burners. Dispersion methods include rotating disc and rotating cup sprayers, and vibrating orifice generators. These can yield highly monodisperse aerosols. The latter device is particularly advantageous since particle size can be calculated a priori from the operating conditions. Solid aerosols can be formed by any of the devices based upon a dispersion method by first forming an aerosol from either a solution of a non-volatile solute or a colloidal dispersion, and then evaporating the solvent. (Author abstract modified)

61130 APTIC NO. 76358

Kessick, M. A., J. V. Matson, and D. M. Pipes

CO-DISTILLATION OF BORIC ACID WITH WATER UNDER AMBIENT CONDITIONS. *Tellus (Uppsala), 27(5):538-539, 1975. 5 refs.*

The co-distillation of boric acid with water under ambient conditions was calculated based on a study of cooling tower drift loss using boron as a trace element. If the total amount of cooling water in the system is maintained constant by make up, any decrease in tracer concentrations occurs as a result of drift loss alone, assuming that the tracer material is suitably involatile. Distillation is important as a mechanism for the introduction of boron into the atmosphere. The fractional nature of this distillation should be taken into account in interpreting experimental results or high concentrations measured in atmospheric water bodies and rainwater.

61131 APTIC NO. 83561

Khan, S. R. and Asrar Ahmad

NUMERICAL ANALYSIS OF GAS EXCHANGE PROCESS IN AN ENGINE CYLINDER-FITTED WITH POPPET VALVE. *J. Inst. Engrs. (India) (Calcutta), vol. 55:238-243, May 1975. (Presented at the Semi-annual Paper Meeting, Bangalore, India, July 20-21, 1974.)*

The development of a digital computer program in FORTRAN language for the numerical analysis of blowdown and supercharging processes in an internal combustion engine cylinder fitted with a poppet valve is described. The program is based on the work of Woods and Kahn and incorporates modifications to solve the boundary conditions using Newton-Raphson method. The calculations carried out by the new method are faster and show perfect agreement with the original method. (Author abstract modified)

61132 APTIC NO. 76579

Klainer, Stanley M.

AN OPTICAL LOOK AT THE ENVIRONMENT. *Opt. Eng., 14(4):S-100-S-111, S-113, July/Aug. 1975. 1 ref.*

The basic concepts of fluorescence analysis are discussed. Fluorescence is a process which is initiated by the absorption of light at a wavelength within a particular absorption band of a molecule. This causes the molecule to enter an excited state because it contains excess energy. There are a number of ways it may then lose this energy and return to the ground electronic state, including the re-emission of light at a longer wavelength. Fluorescence techniques are applied in environmental analysis to determine trace constituents in the atmosphere.

61133 APTIC NO. 83185

Kobayashi, Takanobu, Hiromitsu Uejima, Tomonari Kakishita, and Hiroaki Ida

REACTION RATE FOR NO DECOMPOSITION BY NH3 ON CARBON CATALYSTS (1). STUDIES ON DECOMPOSITION REACTION RATES THROUGH PARTIAL PRESSURES OF COMPONENTS (NH3, NO, O2), AND DEPENDENCE ON REACTION TEMPERATURES. *(Tanso-shitsu shokubai-jo de no NH3 ni yoru NO bunkai hanno sokudo (1). NH3, NO, O2 kaku seibun bunatus ni yoru bunkai hanno sokudo no kento to hanno ondo no izonsei). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 36, 1975. (Presented at the Japanese Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D09.)*

The influence of carbon catalysts on the reduction of nitric oxide by ammonia under normal pressure was studied with respect to the effects of initial concentrations of NH3, NO, and oxygen, and dependence on reaction temperatures. Concentrations of NH3 and NO ranged from 500-1500 ppm; O2 concentrations from 0-200,000 ppm. At 220, 250, and 270 C, with initial NO concentrations of 560 ppm, conversion rates of NO increased with increasing temperatures and increasing initial NH3 concentrations to about 0.85 at 270 C, and 1500 ppm NH2. An increase in the initial O2 concentrations suggested that at 250 C the NO conversion rate was increased, reaching a steady state (0.85), for original NO concentrations of 560 ppm and 1560 ppm, at an original O2 concentration of about 100,000 ppm. A reaction rate equation was derived.

61134 APTIC NO. 76001

Kocmond, W. C., J. Y. Yang, and J. A. Davis

A METHODOLOGY FOR DETERMINING THE EFFECTS OF FUELS AND ADDITIVES ON ATMOSPHERIC VISIBILITY (FINAL REPORT). *Calspan Corp., Buffalo, N. Y., Environmental Protection Agency Contract 68-02-0698, Program Element 1A1002, ROAP 26AAE, Rept. EPA-650/2-75-068, NA-5300-M-1, 56p., June 1975. 1 ref.*

NTIS: PB 245597/AS

The effects of automobile fuels and fuel additives on atmospheric visibility was investigated. Visibility was measured in a 590 cu m smog chamber after the introduction of auto exhaust at a 300:1 detection ratio, the addition of 0.05 ppm sulfur dioxide, and irradiation of the sample for 23 hr. The addition of the gasoline additives F-310 and CI-2 to commercial grade indolene fuel resulted in effects on visibility that were small compared to the effects induced by variations in engine performance. The presence of primary particulates played an important role in both the initial and final visibility observed in the smog chamber. Irradiations of particle-free hydrocarbon-nitirc oxide-sulfur dioxide mixtures comparable to those found in auto exhaust did not produce equivalent visibility losses. The final visibilities were closely correlated with the initial HC/NO ratio. For a given HC/NO ratio, the sulfur content of the fuel appeared to exert the most important effect on visibility. (Author abstract modified)

61135 **APTIC NO. 76064**

Kocmond, W. C., D. B. Kittelson, J. Y. Yang, and K. L. Demerjian

STUDY OF AEROSOL FORMATION IN PHOTOCHEMICAL AIR POLLUTION (ANNUAL REPORT). *Calspan Corp., Buffalo, N. Y., Coordinating Research Council, Inc., and Environmental Protection Agency Contract 68-01-1231, Program Element 1A1008, Rept. EPA-650/3-75-007, NA-5365-m-2, 185p., Aug. 1975. 18 refs.*

NTIS: PB 246060/AS

Smog chamber photochemical aerosol production was examined for systems containing sulfur dioxide and clean air, hydrocarbons and nitric oxide, and HC plus NO plus SO2. System reactivity was characterized in terms of aerosol behavior, with the most important variables being the maximum number concentration, equilibrium surface concentration, and particle volumetric growth rate. Cyclohexene was the most reactive hydrocarbon tested in terms of aerosol production and rate of NO oxidation followed by xylene, hexene, and toluene. There were two phases observed for the simple HC plus NO system. During the initial phase, NO was converted to nitrogen dioxide, with some oxidation of the hydrocarbon occurring. No appreciable aerosol was formed during this phase, though ozone started to appear near the end of this period. The second phase, accompanied by substantial aerosol formation, began as soon as NO was oxidized out of the system and NO2 reached a maximum. Ozone levels rose rapidly during this phase and approached a maximum. The addition of SO2 to the system led to some aerosol formation during the first phase and generally exerted a synergistic effect on aerosol formation in the second phase. The addition of SO2 also led to a marked decrease in the diameter of the particles formed. (Author abstract modified)

61136 **APTIC NO. 79826**

Kregel, M. D., J. M. Heimerl, and E. L. Lortie

LOADER: A CHARACTER MANIPULATION PROGRAM FOR AUTOMATIC CODE WRITING (FINAL REPORT). *Army Ballistic Research Labs., Md., Aberdeen Proving Ground, BRL Rept. 1814, 104p., Aug. 1975.*

A symbolic character manipulation program, LOADER, automatically generates appropriate Fortran expressions for the derivatives associated with a given chemical reaction set. It can be used with the AIRCHEM code for modeling atmospheric chemistry. The requirements for using the program in its present form are included. Details of the coding and character manipulation are discussed. Two subroutines forming the heart of the derivative and of the Jacobian code writing are treated separately. A listing of the program and its output for a typical species and chemical reaction set are included. (Author abstract modified)

61137 **APTIC NO. 79823**

Kurylo, Michael J. and Walter Braun

FLASH PHOTOLYSIS RESONANCE FLUORESCENCE STUDY OF THE REACTION CL + O3 YIELDS CLO + O2 OVER TEMPERATURE RANGE 213-298 K. *Preprint, National Bureau of Standards, Washington, D. C., Physical Chemistry Div., 12p., 1975. 7 refs.*

Rate constants for the removal of chlorine atoms in the reaction in which Cl + ozone form ClO + oxygen were measured by the flash photolysis resonance fluorescence technique over the temperature range 213 to 298 K. The rate constant is given by the Arrhenius expression (2.94 + or - 0.49) times 10 to the -11th power times exp-((298 + or - 39)T) in units of cu cm/molecule/sec. Comparison with recent results from other laboratories is presented. (Author abstract)

61138 **APTIC NO. 76532**

Lindinger, W., D. L. Albritton, F. C. Fehsenfeld, and E. E. Ferguson

LABORATORY MEASUREMENTS OF THE IONOSPHERIC O2+(X(2)IIG) AND O2+(A(4)MICRON) REACTIONS WITH NO. *J. Geophys. Res., 80(25):3725-3726, Sept. 1, 1975. 13 refs.*

Laboratory measurements of oxygen +(sq X IIg) and O2+(a to the 4th power II micron) in charge transfer with nitric oxide were made from 300 K to about 1 eV relative kinetic energy. The 300 K rate constants were 4.4 + or - 0.5 times 10 to the -10th power cu cm/sec and 11 + or - 3 times 10 to the -10th power cu cm/sec, respectively. Most earlier measurements of O2 + NO charge transfer involved an unknown mixture of ion states and yielded values too high to be appropriate to the ionospheric E region. (Author abstract modified)

61139 **APTIC NO. 82644**

Lipeles, M., D. A. Landis, and G. M. Hidy

THE FORMATION OF AEROSOLS IN A PHOTOCHEMICAL FAST FLOW REACTOR (FINAL REPORT). *Rockwell International, Thousand Oaks, Calif., Environmental Protection Agency and Coordinating Research Council Contract 68-02-0771/CAPA-8-71(1-73), General Order No. 551, Rept. SC551.17FR, 73p., July 1975. 11 refs.*

The formation of aerosols from hydrocarbons was studied in a photochemical fast flow reactor. The aerosols were produced in irradiated dry air containing typically 0.8 ppm of nitrogen dioxide and 10 ppm of the hydrocarbon. Ozone and condensation nuclei concentration were measured in the reactor as a function of reactant concentration. Olefin and diolefin compounds were more active than aromatics as nuclei formers. The olefin aerosol contained substantial amounts of oxygenated organics. With the hydrocarbon alpha-pinene, there were sufficient data to show a linear correlation between ozone production and aerosol formation. Gases such as sulfur dioxide and ammonia increased condensation nuclei production. Water vapor at 50% relative humidity decreased or eliminated aerosol production from olefins. (Author abstract modified)

61140 **APTIC NO. 79748**

Lopez-Gonzalez, J. De D., C. Gonzalez-Gomez, and J. M. Ruiz de Almodovar Rivera

DDT, A CONTAMINATING AGENT OF THE ATMOSPHERE. *Anales Quim., 71(5):495-497, 1975. 7 refs.*

The conditions that produce the volatilization of DDT were investigated. When the molecules of DDT insecticide are in aqueous media they volatilize from the surface and can be retained by an adsorbing material such as silica gel. The collection of volatilized DDT by the silica gel lids and the passage of it from the water to the lids is influenced by the concentration of the insecticide in aqueous solution. This behavior of DDT in the presence of water constitutes one way that it causes environmental contamination. (Author abstract modified)

61141 **APTIC NO. 82524**

Loxham, M. and P. M. Heertjes

A THIN FILM MODEL FOR THE LAMINAR FLOW OF A LIQUID ON THE INSIDE WALL OF THE EXIT PIPE OF THE GAS CYCLONE. *Trans. Inst. Chem. Engrs. (London), 53(3):187-190, July 1975. 16 refs.*

The gas in the exit pipe of a conventional gas cyclone continues to swirl for a considerable distance downstream. If a liquid is introduced onto the inside wall of the exit pipe, at gas velocities normally encountered, provided the liquid flow rate is not too high, the flow pattern is annular. A test of the validity of a model of the annular phase flow pattern is reported. A fluid of constant viscosity and density flowing in a thin film in a vertical tube is considered theoretically. Assuming uniform state my have local usefulness. It is impossible to eliminate the interfacial shear stress, because of the severe acceleration terms in the gas spin down. The flow pattern is also a function of the pressure drop. Clean air saturated with water vapor and water/glycerol mixtures were used experimentally with a cyclone and exit pipe. The flow rates of both phases were measured by rotameter and they were carefully kept at the same temperature. The film thicknesses were small, increased with height in the column, and decreased with increasing gas velocity. The continuity wave velocity was measured between heights of 180 mm and 380 mm. Calculated and measured velocities agreed well. The approximate analysis of the two phase flow in the exit pipe of a cyclone that assumes a local uniform motion can give a reasonable description of the system.

61142 **APTIC NO. 80487**

Lunde, Peter J. and Frank L. Kester

CHEMICAL AND PHYSICAL GAS ADSORPTION IN FINITE MULTIMOLECULAR LAYERS. *Chem. Eng. Sci., 30(12):1497-1505, 1975. 19 refs.*

The basic Brunaeur, Emmett and Teller (BET) approach to multimolecular gas adsorption is extended to apply to both chemical and physical gas adsorption in finite layers on porous materials. Closed form solutions are presented to the resultant mathematical models, and the case of first layer chemisorption followed by finite multimolecular physical adsorption is applied to data for the adsorption of water on silica gel to predict a wide range of adsorption isotherms. The correlations predict experimental data with a standard deviation of 7%. Three of five layers of adsorption are involved, with chemisorption in the first layer. Using the experimentally derived model constants, predicted capacity data for Davison 05 silica gel are presented which extrapolate into the experimentally difficult range of partial pressures of water vapor below 1 mm Hg. (Author abstract modified)

61143 **APTIC NO. 80118**

Mackay, Donald and Paul J. Leinonen

RATE OF EVAPORATION OF LOW-SOLUBILITY CONTAMINANTS FROM WATER BODIES TO ATMOSPHERE. *Environ. Sci. Technol., 9(13):1178-1180, Dec. 1975. 3 refs.*

Equations for predicting the approximate rates of evaporative loss of low solubility contaminants in an air-water system are derived. The physical model these equations represent is of well mixed air and water phases separated by an interface with near stagnant films of air and water on either side. Most of the resistance to mass transfer lies in these films. One equation represents a situation in which a water body becomes depleted of a compound introduced at a point in time for example as from an accidental spill. Another equation is used to predict the steady state exchange rate of a compound between the atmosphere and a water body assuming that there is a constant rate of supply of material to one phase and removal from the other. Evaporation parameters and rates for various compounds at 25 C are tabulated.

61144 **APTIC NO. 76589**

MacLaren, J. F. T., A. B. Tramschek, A. Sanjines, and O. F. Pastrana

COMPARISON OF NUMERICAL SOLUTIONS OF THE UNSTEADY FLOW EQUATIONS APPLIED TO RECIPROCATING COMPRESSOR SYSTEMS. *J. Mech. Eng. Sci., 17(5):271-279, Oct. 1975. 18 refs.*

A number of numerical methods which are now available to facilitate solutions to the hyperbolic partial differential equations describing unsteady compressible fluid flow are reviewed. Various schemes are considered and their merits and disadvantages discussed. Equations describing unsteady one dimensional flow with heat transfer, area change, and friction are presented in conservation law, normal, and characteristic forms. Pulsations in a compressor system are predicted using both the two step Lax Wendroff scheme and a scheme based on the characteristic form of the equations. The Lax Wendroff scheme was simpler to apply, required less computer time, and gave better agreement with experimental results obtained from a single stage reciprocating air compressor system. The schemes are also applicable to analyzing the unsteady flow in internal combustion engine systems. (Author abstract modified)

61145 **APTIC NO. 83427**

Mage, David T. and Wayne R. Ott

AN IMPROVED MODEL FOR ANALYSIS OF AIR AND WATER POLLUTION DATA. *Environmental Protection Agency, Las Vegas, Nev. and Washington, D. C., Office of Research and Development, ICESA Proc., Las Vegas, Nev., 1975, 5p., 13 refs. (Sept. 17.)*

The role of univariate probability models in environmental data analysis is discussed, and an improved model involving a censored, three-parameter lognormal distribution is proposed for the analysis of air and water pollution data. When the third parameter of the model is negative, the model is censored at the third parameter; and when the third parameter is zero, the standard two-parameter lognormal model results. The model is examined using air quality data for sulfur dioxide, ozone, carbon monoxide, particulates, hydrocarbons, and nitrogen dioxide. Using the method of maximum likelihood for estimating the parameters, considerable improvement in fit is obtained in comparison with the standard two-parameter lognormal distribution. (Author summary modified)

61146 **APTIC NO. 83633**

Martin, K.

ADSORPTION OF CARBON DIOXIDE ON MOLECULAR SIEVES. *(Adsorption von Kohlendioxid an Molekularsieben). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 232:127-141, 1975. 11 refs.*

Breakthrough curves were measured in the molecular sieve - carbon dioxide - air system as a function of different parameters. The breakdown began earlier as the flow rate of the gas and the CO2 concentration were increased. The diffusion process was accelerated by increasing initial temperature. The breakdown was delayed with decreasing particle size. A comparison of experimental results and values calculated from Rosen s model showed good agreement, which indicates the suitability of this model for the evaluation of changes in different parameters, and for the prediction of the adsorption behavior.

61147 **APTIC NO. 80469**

Masliyah, Jacob H.

AEROSOL REMOVAL BY DIFFUSION AND INTERCEPTION IN MATS OF ELLIPTIC FIBRES. *Can. J. Chem. Eng., 53(5):568-571, Oct. 1975. 7 refs.*

Removal of spherical aerosol particles using a filter mat of elliptical fibers by pure interception and by pure diffusion was studied. A cell model is used to described the flow field about a typical elliptical fiber in the filter mat. The removval efficiencies due to interception and diffusion are given for circular fibers. A basis is developed for comparing the effectiveness of filter mats made of elliptical as against those made of circular fibers. A formula is derived for the enhancement index of a filter mat. Mats employing elliptical fibers gave higher values of enhancement index, compared to mats of circular fibers, for Reynolds numbers of 0.01 and 1.0. It would be preferable to use mats made of elliptical fibers when the aerosol particle removal is due to pure interception.

61148 **APTIC NO. 82238**

Masuda, Senichi, Kensuke Akutsu, and Noriyoshi Ishiga

ON THE CHARGES OF ATMOSPHERIC AEROSOLS BY ELECTRON BEAM METHOD. *(Denshi biimu ni yoru kichu earozoru no kaden ni tsuite). Text in Japanese. Tokyo Daigaku Kogakubu Sogo Shikenjo Nenpo (Annu. Rept. Res. Inst., Fac. Eng., Univ. Tokyo), no. 34:161-163, 1975. 4 refs.*

It was experimentally determined that ion density in irradiated air space is governed by the occurrence of recombination of positive and negative ions. On this basis, it became possible to obtain the total amount of absorption by determining conductivity. By determination of the equilibrium potential and the conductivity, localized electron current density can be deduced. Effect on charge by electron collisions is negligible. Gas conductivity is proportional to the square root of electron beam current. Conductivity was measured with a parallel plate electrode setup (main electrode and guard electrode). Equilibrium potential was measured by the floating probe method.

61149 **APTIC NO. 83383**

Matecki, Marc, Andre Thomy, and Xavier Duval

COMPARISON OF ADSORPTION ISOTHERMS OF NITRIC OXIDE ON DIFFERENT GRAPHITE SURFACES. *(Comparaison des isothermes d adsorption de monoxyde d azote sur differentes surfaces graphitiques). Text in French. C. R. Acad. Sci. (Paris) Ser. C, 281(16):639-642, Oct. 20, 1975. 11 refs.*

The adsorption isotherms of nitric oxide on exfoliated graphite were compared to those obtained, at liquid nitrogen temperature, on non-exfoliated natural graphite and to those on type Sterling MTG carbon black graphitized at about 3000 C. Results indicate that the double phase changes previously observed during the formation of the first adsorption layer of nitric oxide on exfoliated graphite are not particular to that of graphite alone; however, the isotherm characteristics are clearer on the exfoliated graphite than on the others.

61150 **APTIC NO. 79592**

McNall, Preston, E., Jr.

PRACTICAL METHODS OF REDUCING AIRBORNE CONTAMINANTS IN INTERIOR SPACES. *Arch. Environ. Health, 30(11):552-556, Nov. 1975. 7 refs. (Presented at the International Workshop on the Effects of Tobacco Smoke on the Nonsmoker, Hamilton, Bermuda, March 27, 1974.)*

A rational theory for predicting air contamination levels in laboratory experiments or in field situations was developed and verified with tobacco smoke as the contaminant. The analysis is completely general in nature and the contaminants can be gases, vapors, liquid droplets, and solid particulates, including microorganisms and pollens. Several engineering controls can be applied to practical environmental systems to reduce and control undesirable contaminants in normally occupied structures. The use of the method is an important research tool to more accurately quantify airborne contaminant levels in environmental medicine experiments with animals or human subjects. It is difficult and expensive to control inside environmental contaminant levels at values less than 20 to 25% of those occurring outside. The same is true for internally generated contaminants. (Author abstract modified)

61151 **APTIC NO. 83726**

McRae, Douglas, Egon Matijevic, and E. James Davis

CHEMICAL REACTIONS IN AEROSOLS. I. BROMINATION OF OCTADECENE DROPLETS. *J. Colloid Interface Sci., 53(3):411-421, Dec. 1975. 21 refs.*

A monodispersed aerosol of 1-octadecene produced in a falling film generator was reacted with bromine vapor at constant vapor pressure. The reaction time was controlled by changing the length of the glass tube through which the 1-octadecene aerosol and Br2 vapor passed at a fixed flow rate. The particle size distribution of the aerosol was measured before and after bromination by light scattering and no significant changes were observed. The reaction products were collected using a thermal gradient precipitator and analyzed for the degree of bromination by infrared spectroscopy. The factors that control the kinetics of the aerosol-vapor reaction, such as gas or liquid, phase diffusion, or the liquid phase reaction, are discussed. The liquid phase reaction between the 1-octadecene and the Br2 dissolved in the droplet controlled the rate of bromination under the conditions of these experiments. (Author abstract modified)

61152 **APTIC NO. 80482**

Melo, Octavio, T. and Colin R. Phillips

AEROSOL-SIZE SPECTRA BY MEANS OF NUCLEPORE FILTERS. *Environ. Sci. Technol., 9(6):560-564, June 1975. 13 refs.*

The size and chemical composition of submicron aerosols were investigated using the retention characteristics of Nuclepore filters and measurements of filter loadings. Experiments were conducted with both homogeneous and heterogeneous aerosols generated from solution by atomization. The spectra calculated from the experimental loadings were compared with those determined from electron microscope counts of the test aerosol. Good agreement was observed for aerosols of mass median diameter between 0.1 and 1.0 micron and good repeatability was found. (Author abstract modified)

61153 **APTIC NO. 76408**

Meyer, J. P. and M. D. Kostin

CIRCULATION PHENOMENA IN STEFAN DIFFUSION. *Int. J. Heat Mass Transfer, 18(11):1293-1297, Nov. 1975. 5 refs.*

Coupled diffusion and Navier Stokes equations are used to analyze Stefan diffusion. Numerical solutions of the diffusion and hydrodynamic equations show the existence of circulation patterns for the stagnant species in a binary system. These results establish that the frequently made simplifying assumption that the nonvolatile species in Stefan diffusion is stagnant is invalid. Results are presented showing how the flux and velocity profiles depend on the dimensions of the system. (Author abstract)

61154 **APTIC NO. 83915**

Mikhaylov, G. V. and V. S. Vitkov

FORMULAS FOR THE CALCULATION OF THE THERMODYNAMIC RELATIONS OF THE OXIDATION OF SULFUR DIOXIDE. *(Uravnyeniya dla raschota termodinamicheskikh zavisimostey protsessa okislyeniya dvuokisi seri). Text in Russian. Zh. Prikl. Khim., 48(10):1-2, Oct. 1975. 3 refs.*

On the basis of improved data, equations for the calculation of the thermal effect in the oxidation of sulfur dioxide according to standard thermal formulations and enthalpy changes of the components with regard to 298.15 obtained by means of a computer. The equation for the calculation of the equilibrium constant of the oxidation process of sulfur dioxide was determined. The thermal function of the equilibrium constant was obtained by means of the Wand-Hoff Equation and the adjusted integration constant from experimental data. The calculated thermal effect was significant. In the range of low temperatures, the computed equilibrium constant differed considerably from the data quoted in the literature.

61155 **APTIC NO. 76331**

Mishra, G. C. and R. D. Srivastava

KINETICS OF OXIDATION OF AMMONIUM SULFITE BY RAPID MIXING METHOD. *Chem. Eng. Sci., 30(11):1387-1390, Nov. 1975. 23 refs.*

The kinetics of the reaction of oxygen with ammonium sulfite in aqueous solution was studied by a rapid mixing method at 30 C. The rate of oxidation of ammonium sulfite is approximately twice as low as that of sodium sulfite. The reaction rate is zero order with respect to oxygen and three-halves order with respect to sulfite, and the promoting effect of cobalt ions is proportional to the square root of the total concentration of cobalt added to the reacting solution. The apparent activation energy for the overall oxidation is 21.5 kcal/g mole. A reaction mechanism is proposed, and a rate expression derived is in good agreement with the experimental data. (Author abstract modified)

61156 **APTIC NO. 82239**

Miyauchi, Terukatsu, Shoji Kimura, and Masayoshi Ohno

STUDIES ON THE SEPARATION OF RADIOACTIVE WASTE GASES BY MEMBRANES. *(Hoshasei haiki gasu no maku bunri ni kansuru kenkyu). Text in Japanese. Tokyo Daigaku Kogakubu Sogo Shikenjo Nenpo (Annu. Rept. Eng. Res. Inst., Fac. Eng., Univ. Tokyo), no. 34: 287-290, 1975. 1 ref.*

Cellulose acetate membranes, cast and freeze-dried, were used to separate gas mixtures (neon-oxygen; helium-neon; helium-argon; helium-xenon). Equations were derived for obtaining separation factors and permeabilities of the gas mixtures, from pure gas permeabilities. Experimental pressures of the gas mixtures were 5 and 10 kg/sq cm. When separation factors are small (neon- oxygen; helium-neon), there is a good agreement between calculated and experimental values. At larger values of separation factors (especially helium-xenon), there is less and less agreement. Also, when separation factors are large, there is more dependence on concentrations.

61157 **APTIC NO. 79679**

Montgomery, Thomas L. and Jesse H. Coleman

EMPIRICAL RELATIONSHIPS BETWEEN TIME-AVERAGE SO2 CONCENTRATIONS. *Environ. Sci. Technol., 9(10):953-957, Oct. 1975. 12 refs. (Presented at the American Meteorological Society Conference on Air Pollution Meteorology, Raleigh, N. C., April 5-8, 1971.)*

The relationships between time-averaged sulfur dioxide concentrations are calculated for ratios of peak to mean concentrations and ratios of maximum concentrations. Peak to mean SO2 concentration ratios are derived from 2 1/2 yr of ambient SO2 data collected by 14 SO2 monitors near the TVA Paradise coal-fired power plant in Kentucky. Regressions of peak to mean ratios vs. ratio percentile are computed for mean time periods of 1, 2, 3, and 24 hr, 1 mo, and 1 yr. From these regressions peak to mean ratios for the 99th, 95th, 50th, and 5th percentiles are reported. Ratios of maximum SO2 concentrations are derived from data collected at eight of TVA s coal fired power plants. For each of these plants, ratios are computed for maximum 1-hour concentrations to maximum T-hour concentrations, where the T-hour period ranged over times of 3 and 24 hr, 1 mo, and 1 yr. The relationships between these ratios and stack height are presented graphically. (Author abstract modified)

61158 **APTIC NO. 82528**

Moore, John H., Jr.

THE EXCITATION OF NEAR-UV EMISSION BY H+, H(O), AND HE+ IMPACT ON CO2 and N2O at 0.7-10 KEV. *J. Geophys. Res., 80(25):3727-3730, Sept. 1, 1975. 15 refs.*

The source and intensity of near ultraviolet radiation which results from collisions of hydrogen(+), H(o), and helium(+) with the isoelectronic molecules carbon dioxide and nitrous oxide are analyzed. Emission spectra in the 2850-4300 A region produced by a 0.7 to 10 keV impact consists almost exclusively of the A-X and B-X systems of CO2(+) and the A-X system of N2O(+). There are no emissions from excited fragments of the parent molecules. Cross sections for proton impact excitation reach maxima of 1-4 times 10 to the -16th power sq cm in the collision energy range observed. Cross sections for H(o) excitation reach maxima of 0.4-1 times 10 to the -16th sq cm. (Author abstract modified)

61159 **APTIC NO. 73409**

Munemori, Makoto, Kazuo Kozaru, and Yasuaki Maeda

ROLE OF HYDROCARBONS IN PHOTODECOMPOSITION REACTION OF NO2 (2). *(NO2 no kobunkai hanni ni okeru tanka suiso yakuwari (2)). Text in Japanese. Preprint, Chemical Society of Japan, Tokyo, p. 787, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 1041.)*

The role of hydrocarbons in the photodecomposition of nitrogen dioxide was examined. A visible light source and black light (maximum wavelength, 360 nm) were used to irradiate reaction material in a Pyrex reaction chamber (11.6 l in volume). Hydrocarbons investigated were ethylene, propylene, n-butane, 1-butene, cis-2-butene, and trans-2-butene. Olefins which react most readily with atomic oxygen slowed down the photodecomposition rate of NO2, even in low concentrations (e.g., cis-2-butene at concentrations of about 7 ppm). In an NO2-hydrocarbon system, competing reactions for atomic oxygen, having nearly the same rate constants, occur with NO2 and hydrocarbon. When atomic oxygen reacts with NO2, nitric oxide and O2 are formed; reaction of atomic oxygen with hydrocarbon forms other products, and slows photodecomposition of NO2.

61160 **APTIC NO. 84291**

Nagata, K.

GENERATION MECHANISM OF NITROGEN OXIDES. *(Chisso sankabutsu (NO) no seisei kiko ni tsuite). Text in Japanese. Boira Kenkyu (J. Japan Boiler Assoc.), no. 150:1-11, April 1975. 22 refs.*

The generation mechanism of thermal nitrogen oxides and fuel nitrogen oxides are explained. Although it was hitherto held that most NOx was thermal NOx, it has been found recently that fuel NOx exerts considerable influence. The Zeldovich formula is explained, as well as the theories of Fenimore and Sternting. According to the expanded Zeldovich mechanism, the higher the oxygen concentration and the longer the combustion stays in a high temperature range, the more nitric oxide is generated. Fenimore s theory on fuel NOx is explained, as well as Kato s. Generation of NOx in actual boiler combustion shows that the N content in the fuel does not affect the fuel NOx conversion ratio too greatly. When the flame temperature is lowered, the conversion ratio is not affected. The kinds of N compounds contained in the fuel do not affect the fuel NOx conversion ratio. As the air ratio rises, the conversion ratio also rises. The fuel NOx conversion ratio is around 30-50%. The N content in fuel matters in the case of fuel oil, coal, and coking coal.

61161 **APTIC NO. 76477**

Narkis, Y. and B. Gal-or

TWO-PHASE FLOW THROUGH NORMAL SHOCK WAVE. *J. Fluids Eng., 97(3):361-365, Sept. 1975. 13 refs. (Presented at the Joint Fluids Engineering and Lubrication Conference, Minneapolis, Minn., May 5-7, 1975, Paper 75-FE-25.)*

The steady, one-dimensional flow of compressible gas containing particles through a normal shock wave is investigated and a set of general equations is derived. Two-phase flow with high particle mass flow is considered. The final equilibrium conditions are analytically solved and the relaxation zone is calculated numerically. The error in neglecting the particle volume is considerable in the calculation of the velocities. An approximate solution is given for the case of low particle mass flow through a weak shock wave. Use is made of small perturbations for zero and first orders. The solution for this case describes the flow in the relaxation zone quite accurately, and shows its dependence on the physical properties of both gas and droplets. (Author abstract modified)

61162 **APTIC NO. 80312**

Natarajan, Ramamurthy and Amit K. Ghosh

PENETRATION HISTORIES OF VAPORIZING FUEL DROPS INJECTED VERTICALLY INTO STAGNANT GAS. *Fuel, 54(4):253-255, Oct. 1975. 3 refs. (Presented at the Fluid Mechanics and Fluid Power National Conference, 5th, Bombay, India, Dec. 1974.)*

Penetration histories for vaporizing fuel droplets injected vertically downward or upward into stagnant gas were obtained by integrating the velocity histories. Neglect of gravity causes considerable errors except for downward injection with Stokes drag coefficient based on instantaneous velocity. (Author abstract)

61163 **APTIC NO. 76623**

Naumann, A. W. and A. S. Behan, Jr.

THE EFFECTS OF PRECIOUS METAL PROMOTERS ON THE REDUCTION OF VANADIUM PENTOXIDE BY HYDROCARBONS. *J. Catalysis, 39(3): 432-436, Sept. 1975. 10 refs.*

The effects of precious metal promoters on the reduction of vanadium pentoxide by hydrocarbons were investigated. The reduction of V2O5 by ethylene, propylene, ethane, and propane proceeds at lower temperatures in the presence of palladium, platinum, rubidium, or silver. Palladium is the most effective in promoting reactivity. For V2O5-Pd with ethylene, a dimerization to butenes is the principal reaction at 100 C, a partial oxidation to acetaldehyde predominates at 150 C, and a more complex oxidation to carbon monoxide, carbon dioxide, and water at temperatures above 200 C. No dimerization and no significant yield of acetaldehyde or other oxygen containing hydrocarbons is observed with the other additives. The oxidation of the hydrocarbons by the precious metal-V2O5 combinations proceeds by a migration of oxygen through the V2O5 lattice to react with hydrocarbon or hydrocarbon residues adsorbed at sites on or near the precious metal additives. (Author abstract modified)

61164 **APTIC NO. 79667**

Niiyama, Hiroo and Etsuro Echigoya

INFRARED AND TEMPERATURE PROGRAMMED DESORPTION STUDIES OF NITRIC OXIDE ADSORBED ON COBALT-SILICA CATALYST. *J. Catalysis, 38(1-3):238-244, June 23, 1975. 14 refs.*

Infrared and temperature programmed desorption studies were made of nitric oxide adsorbed on cobalt-silica catalyst. Two species were found, with nitrogen-oxygen stretching frequencies at 1790 and 1850/cm, respectively. The former arose from strongly chemisorbed species and is the intermediate species in the reaction between NO and reduced surface. Bases such as ammonia, NH2CH3 (methylamine), NH(CH3)2 (dimethylamine), and N(CH3)3 (trimethylamine) lower the N-O stretching frequencies of preadsorbed NO and weaken the N-O bond. Hydrogen chloride shifts the bands to higher frequencies and facilitates desorption. These effects are explained on the basis of a change in the electron density of metal-N-O molecular orbitals when the second gases are admitted. (Author abstract modified)

61165 **APTIC NO. 83515**

Nishimura, Koichi, Okihiro Takunaga, and Masamitsu Washino

REACTION MECHANISMS UPON RADIOACTIVE TREATMENT OF EXHAUST GASES (2). OXIDATION OF NITRIC OXIDE BY ELECTRON RAY IRRADIATION. *(Haigasu no hoshasen shori ni kansuru hanno kiko (2). Denshisen shosha ni yoru issanka chisso no sanka). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 28, 1975. (Presented at the Japanese Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D01.)*

Electron rays (generated at 1.5 MeV; 0.5-3 mA) were used to irradiate 1% concentrations of nitric oxide or nitrogen dioxide in nitrogen in a stainless steel flow-through apparatus (volume, 1 liter). Dosages ranged from 0-6 Mrad/sec. When the oxygen concentration was 3%, and the original NO concentration was 500 ppm, the oxidation rate and the rate of formation of NO2 decreased. Above 4 Mrad, changes in concentrations of NO and NO2 were negligible, and a straight-line relationship with a slope of 0.5 was found for a log-log plot of the respective concentrations. When gas containing NO2 was irradiated, NO2 concentrations continued to decrease with an increase in Mrad, while NO concentrations increased. An active species R, which is not ozone (possibly oxygen atoms), oxidized NO to form NO2, but this NO2 again reacted with R to regenerate NO.

61166 **APTIC NO. 83251**

Nojima, K., K. Fukaya, S. Fukui, and S. Sugano

STUDIES ON PHOTOCHEMICAL AIR POLLUTION PART 2. FORMATION OF NITROPHENOLS BY PHOTOCHEMICAL REACTION OF AROMATIC HYDROCARBONS. *(Kokagakukogai no kenkyu. 2. Hokozoku tankasuiso no kokagaku hanno niyoru nitrophenol rui no seisei). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep. Kanagawa Pref. Environ. Cent.), no. 7:31, Dec. 1975.*

Hydrocarbons such as benzene, toluene, and xylene, which are contained in auto exhaust form glyoxals, such as methylglyoxal and acetyl, by cleavage of a benzene ring in photochemical reactions with nitrogen oxides. Unknown yellow compounds were also found as the products of the reaction. Because of the large amounts of these yellow compounds, their identification was studied. When benzene was used as the raw material the abovementioned reaction yielded 4 kinds of nitrophenols: o- and p-nitrophenol, 2,4- and 2,6-dinitrophenol, and nitrobenzene. Because of their very similar physiological effects, these nitrophenols were thought to be sources of photochemical damage to organisms.

61167 **APTIC NO. 80151**

Nozaki, Fumio, Fumio Matsukawa, and Yoshikazu Mano

A STUDY OF CATALYSIS BY URANIUM OXIDE AND ITS MIXED CATALYSTS. IX. A CATALYTIC REDUCTION OF NITRIC OXIDE WITH CARBON MONOXIDE. *Bull. Chem. Soc. Japan (Tokyo), 48(10):2764-2768, 1975. 7 refs.*

The reduction of nitric oxide with carbon monoxide over the uranium oxide catalyst and its mixed catalysts with alkali metal oxide or alkaline earth metal oxide was investigated using conventional flow and pulse reactors at temperatures of 250-450 C under atmospheric pressure. The activity of the uranium oxide catalyst without any additive is higher than that of the iron oxide catalyst, although it is inferior to that of the copper oxide-chromium oxide catalyst. The addition of alkali metal oxide or alkaline earth metal oxide to uranium oxide, particularly in the case of cesium oxide or potassium oxide is effective in enhancing the catalyst activity. The reduction of NO to nitrogen proceeds consecutively, passing through nitrous oxide as a gas phase intermediate. The reaction rates are formulated and suggest a redox reaction sequence. The ox-

idation states of the catalysts are discussed. (Author abstract modified)

61168 **APTIC NO. 80163**

O Brien, Robert J., John R. Holmes, and Albert H. Bockian

FORMATION OF PHOTOCHEMICAL AEROSOL FROM HYDROCARBONS. CHEMICAL REACTIVITY AND PRODUCTS. *Environ. Sci. Technol., 9(6):568-576, June 1975. 14 refs.*

Photochemical aerosol formation from organic compounds was investigated in an environmental chamber. Various classes of compounds were irradiated with oxides of nitrogen, and light scattering caused by the aerosol was measured concurrently. Diolefins and cyclic olefins were very effective in reducing visibility while monoolefins and aromatics produced only minimal amounts of light scattering aerosol. Paraffins produced no measurable aerosol. More detailed study of the reactivity of diolefins was carried out. Higher levels of nitrogen dioxide inhibited aerosol formation. The major aerosol constituents were monocarboxylic and dicarboxylic acids and short chain polymers incorporating organic nitrate groups. A reaction scheme accounting for aerosol formation from reactive olefins is proposed. (Author abstract)

61169 **APTIC NO. 84192**

Ohashi, Takao and Yoshinori Katagiri

FORMATION OF NITRO-COMPOUNDS BY PHOTOCHEMICAL REACTION. *(Kokagaku hanno ni yoru nitoro kagobutsu no seisei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):267, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 4.)*

The photochemical formation of nitrobenzene, o-nitrophenol, and p-nitrophenol was studied for the reaction between benzene and nitrogen oxides in a smog chamber filled with 5 ppm benzene and 50 ppm NOx, and irradiated with 356 nm radiation of 12 mw/sq cm intensity for up to 5 hr at 30 C with a humidity of 50%. The nitrophenols produced were extracted with ether from the sodium hydroxide solution to which the reacted gas was absorbed. The extracted nitrophenols were then converted to nitroanisoles by the addition of diazomethane to the ether solution, and determined by gas chromatography with an electron capture detector. The production of both nitrobenzene and o-nitrophenol increased with increased irradiation time. The production of p-nitrophenol peaked out at 2.26 ppm for an irradiation time of 2 to 3 hr. The p-nitrophenol concentration in the chamber decreased with increased irradiation time. After 6 hr irradiation, the concentration of nitrobenzene, o-nitrophenol, and p-nitrophenol in the smog chamber was 7.62, 2.18, and 1.63 ppb respectively. No ozone formation could be detected during 6 hr irradiation.

61170 **APTIC NO. 80100**

Ohkubo, Katsutoshi, Hiromichi Ikebe, and Masahide Okada

A CONFORMATIONAL STUDY OF THE NOX(X EQUALS 1 OR 2)-CATALYZED ISOMERIZATION OF CIS-2-BUTENE USING THE INDO-UHF-METHOD. *Bull. Chem. Soc. Japan (Tokyo), 48(10):2667-2672, 1975. 29 refs.*

The nitrogen oxides (nitric oxide or nitrogen dioxide) catalyzed isomerization of cis-2-butene was investigated using the INDO-UHF theory. The NOx addition process to form the intermediate radical (R1) has no appreciable activation barrier, although the NO2-fission process from the intermediate radical (R2) has the carbon-NO2 dissociation energy of 44.6 kcal/mol. The calculated internal-rotation barrier of the intermediate radical (R1) around the C-C bond is smaller than that obtained from the thermodynamic estimations. The energetically most stable or unstable rotamer is in the staggered or the eclipsed configuration respectively. A hydrogen bonding effect on the stabilization is observed in staggered configuration, although a remarkable effect of the homoconjungation or the repulsive interaction of unpaired and lone paired electrons can be disregarded in the present internal-rotamer. (Author abstract modified)

61171 **APTIC NO. 84449**

Okhotskiy, V. B.

ASSESSING THE ASSIMILATION OF OXYGEN BY THE METAL BLOWN IN THE CONVERTER FROM THE COMPOSITION OF THE GAS PHASE. COMMUNICATION 1. *(Otsenka usvoeniya kisloroda pri produvke metalla v konvertore po sostavu gazovoy fazy. Soobshchenie 1). Text in Russian. Izv. Vysshikh Uchebyn. Zavedenii, Chernaya Met., no. 2:28-31, 1975. 1 ref.*

Mathematical formulas are presented for the determination of the oxygen assimilation coefficient for metal blown with air or oxygen-enriched air in top-blown or bottom-blown converters on the basis of the composition of the gaseous phase emitted from the converter. Part of the residual oxygen present in the waste gas, and part of the fresh air diluting the waste gas are used for the oxidation of carbon monoxide to carbon dioxide.

61172 **APTIC NO. 82532**

Okuda, Kyohkai

PIPE WALL EFFECTS ON SUSPENSION VELOCITIES OF SINGLE FREELY-SUSPENDED SPHERES AND ON TERMINAL VELOCITIES OF SINGLE SPHERES IN A PIPE. *Bull. JSME (Japan Soc. Mech. Engrs.), 18(124):1142-1150, Oct. 1975. 10 refs.*

Experimental results are presented and discussed concerning two velocities of single spheres falling through fluid in a pipe, subjected to the pipe wall effects in both vertical and inclined pipes: the mean suspension velocities of freely suspended spheres (vl) and the terminal velocities of spheres falling through still water in a pipe (v2). Experiments were carried out with various sphere materials, sphere diameters, pipe diameters, and pipe inclination angles. The two velocities are not always identical. Equations were obtained for the ratio of vl and v2 to the theoretical terminal velocity of the spheres. These ratios did not vary significantly with variation of the sphere weight in the test range. Ratios of v2 to vl range from 1.10 to 1.35 for the straightly falling spheres and from 0.90 to 1.03 for the oscillating spheres. (Author abstract modified)

61173 **APTIC NO. 80132**

Ota, Yasuhiko, Yasushi Takahashi, Kazunori Wakai, and Hironori Endo

ESTIMATION OF EXCESS AIR RATIO IN PRECOMBUSTION CHAMBER OF DIESEL ENGINE BY GAS ANALYSIS. *(Gasu bunseki ni yoru diizeru kikan yonenshoshitsu nai no kuki kajyoritsu no tsuite). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 493-499, 1975. 8 refs. (Presented at the Society of Automotive Engineers of Japan Inc. Lecture Meeting, Kyoto, Oct. 29-30, 1975.)*

A method for estimating the excess air ratio in precombustion chambers of diesel engines is described. The average excess air ratio was calculated from analysis of combustion gas sampled at the bottom of the precombustion chamber at Pme equals 9 and 1300 rpm. The relative fuel-air ratio with respect to elements contained in carbon dioxide, water, carbon monoxide, and hydrogen (hot flame) was 1.6, while the relative fuel-air ratio with respect to all elements in fuel based on the analysis of exhaust gas was 2.2. The relative fuel-air ratio (hot flame) of combustion gas obtained by autoignition of an n-heptane and air mixture with a fuel-air ratio of 2 was 1.8, which was in fairly good agreement with the above-mentioned value obtained from Schanakig s data. The combustion of a gaseous mixture with a high fuel-air ratio (above three) is presumed to be a non-equilibrium and selective reaction.

61174 **APTIC NO. 83133**

P. Mailath, Fleur, Jozsef Morik, and Lajos Nagy

STUDY OF TRANSFORMATION UNDER NATIONAL CONDITIONS OF POLYCYCLIC- AROMATIC HYDROCARBONS OCCURRING IN THE ENVIRONMENT. *(Kornyezetunkben elofordulo policiklikus aromas szenhidrogenek atalakulasanak tanulmanyozasa termeszetes korulmenyek kozott). Text in Hungarian. Egeszsegtudomany, 19(3):285-291, 1975. 17 refs.*

Qualitative thin-layer chromatographic study of the transformation of fluoranthene, pyrene, perylene, 1,12-benzoperylene, chrysene, 1,2-benzoanthracene, 9,10-dimethyl-1,2-benzoanthracence, 1,2,5,6-dibenzoanthracence, 1,2-benzopyrene, and 3,4-benzopyrene under natural conditions in urban air and clean air is described. The urban air contained 0.02 mg/cu m of sulfur dioxide and 0.007 mg/cu m of nitrogen oxides at a total sulfur content of 0.8 mg/100 hr. The air at a site with low pollution level contained 0.001 mg of total sulfur per 100 hr., 0.003 mg/cu m of SO2 and 0.015 mg/cu m of nigrogen oxides. The samples were exposed to solar radiation for 3 hr. All polycyclic aromatic hydrocarbons showed degradation in sunlight after a minimum exposure time of 1 hr. Complete degradation of 1,2-benzoanthracene and 9,10-dimethyl-1,2- benzoanthracene was observed. The degradation products of 1,2-benzoanthracene and 3,4-benzopyrene showed no qualitative changes during the irradiation up to 3 hr. Two stable metabolites of 3,4-benzopyrene with Rf values of 0.23 and 0.34 were found in the samples irradiated in urban air, but they were absent in samples irradiated in clean air. In general, the number of the degradation products was higher in urban air than in clean air. Certain labile intermediary products disappeared by the end of the irradiation. The presence of additional metabolites, and the higher rate of decomposition in urban air may be due to the effect of SO2.

61175 **APTIC NO. 83784**

P. Mailath, Fleur and Jozsef Morik

THIN-LAYER CHROMATOGRAPHY OF PHOTOOXIDATION OF 3,4-BENZOPYRENE. *(A 3,4-benzpiren fotooxidaciojanak vekonyretegkromatografias tanulmanyozasa). Text in Hungarian. Egeszsegtudomany, 19(3):277-284, 1975. 17 refs.*

The effect of 19-day exposure to sunshine, darkroom, and cassette storage on the degradation of 3,4-benzo(a)pyrene on silicagel G layer was studied. The substance on the layer was consecutively eluted with solvents of increasing polarity (cyclohexane, benzene, ether, acetone, ethanol, and water). Six products were distinguished (not identified) in samples exposed to sunlight, 8 in samples kept in a darkroom partly sheltered from light, and 4 in samples kept in cassettes with total exclusion of light. One of these compounds appeared only in the cassetted samples, and two only in the darkroom samples. On repeated irradiation, the majority of the products showed further decomposition and conversion of labile products to more stable ones. Each of these products showed separate fluorescence and yellow, greenish, beige, red, blue and violet color in UV light. The process involved is considered to be a progressing oxidation during which derivatives of phenol and carboxylic acid type are formed from 3,4-benzo(a)pyrene by the splitting up of the ring.

61176 **APTIC NO. 76282**

Paech, F., R. Schmiedl, and W. Demtroeder

COLLISION FREE LIFTIMES OF EXCITED NO2 UNDER VERY HIGH RESOLUTION. *J. Chem. Phys., 63(10):4369-4368, Nov. 15, 1975. 22 refs.*

The output beam from a single mode argon laser, tunable around lambda equals 4880 and 5145 A, is crossed perpendicularly with a well collimated nitrogen dioxide beam. The lifetimes of selectively populated hyperfine structure levels in electronically excited states were measured under collision free conditions at NO2 pressures below 0.0001 torr, using pulse modulation of the laser beam and single photon counting techniques. Several directly excited states have short liftimes (1-3 microsec) which are determined mainly by fast internal conversions to neighboring excited states, but only partly by fluorescence to the ground state. There are at least two such vibronic states, which are populated by nonradiative transitions from the primarily excited state and which show fluorescence decay with liftimes around 30 and 100 microsec. The primarily excited state has 2B1 character. The fluorescence is mainly emitted from 2B2 states. (Author abstract modified)

61177 **APTIC NO. 80319**

Parks, N. J., N. F. Peek, and E. Goldstein

THE SYNTHESIS OF 13N LABELED ATMOSPHERIC GASES VIA PROTON IRRADIATION OF A HIGH PRESSURE OXYGEN TARGET. *Intern. J. Appl. Radiation Isotopes, 26(11):683-687, Nov. 1975. 18 refs.*

The bombardment of a 10-15 atm high purity oxygen target with a 5-10 microampere beam of 15 MeV proton produces 13N(t sub 1/2 equals 9.96 min) by the 160(p, alpha) 13N nuclear reaction. The nitrogen atoms are incorporated into the primary products, 13N2, 12N2O, and 13NO2 in a ratio of 8:1:3.5, respectively. Cryogenic recovery of 13NO2 under steady state production conditions corresponds to lmCi/microampere. The concentration of radiolytically produced carrier NO2 is in the range of 0.3-0.6 ppm. (Author abstract)

61178 **APTIC NO. 80475**

Person, Willis B., Stasys K. Rudys, and James H. Newton

ABSOLUTE INTEGRATED INFRARED ABSORPTION INTENSITIES OF CFCL3 AND CF3I FUNDAMENTALS IN THE GASE PHASE. AN INTENSITY SUM RULE. *J. Phys. Chem., 79(23):2525-2531, Nov. 6, 1975. 17 refs.*

Absolute integrated molar absorption coefficients, A, were measured for infrared absorption by all the fundamental vibrations of trifluoroiodomethane and for v2, v3, v5, and v6 of Freon 11 (CFCl3) in the gas phase. These data were analyzed to determine the possibility of monitoring the infrared absorption to measure the extent of Freon contamination of the atmosphere by a remote sensing device. Although such an application is not easy, it is feasible. The intensity values were compared with measurements of the absolute infrared intensities of other chlorofluoromethanes. An intensity sum rule was formulated and tested by the data for these molecules. Application of the rule to predict the intensities for an unknown molecule was illustrated for CFClH2. (Author abstract modified)

61179 **APTIC NO. 76405**

Petrov, N. M.

DETERMINATION OF THE MAXIMUM PREHEATING OF THE REACTION GAS MIXTURE DURING THE ADIABATIC OXIDATION OF SULFUR DIOXIDE. *Int. Chem. Eng., 15(4):707-710, Oct. 1975. 4 refs.*

An approximate method for performing heat balance calculations for the oxidation of sulfur dioxide to sulfur trioxide under either isothermal or adiabatic conditions is presented. It is based upon the definition of an adiabatic preheating coefficient. These relationships are recommended for engineering calculations of the process of oxidation of sulfur dioxide in those cases where great accuracy is not required.

61180 **APTIC NO. 76616**

Poc, Marie-Martine and Maud Roulleau

THE ICE NUCLEATING PROPERTIES OF AN ULTRAFINE AEROSOL OF PURE SILVER IODIDE. *J. Appl. Meteorol., 14(6):1146-1150, Sept. 1975. 30 refs.*

A silver iodide aerosol was prepared by reacting iodine vapor with a silver aerosol in an inert dry atmosphere and in darkness. The preparation of the silver aerosol and the iodine vapor and the reaction to form AgI are described. The concentration was 1 to 5 times 10 to the 6th power particles/cu cm. Particle diameter was between 10 and 30. The ice nucleating properties of the aerosol were studied in a cloud mixing chamber. There were 2 times 10 to the 14th power active freezing nuclei/g AgI. (Author abstract modified)

61181 **APTIC NO. 80002**

Rao, D. N. and D. Pal

A PLANT GROWTH CHAMBER FOR AIR POLLUTION STUDIES. *Indian J. Environ. Health, 17(2):105-110, April 1975. 9 refs.*

A portable plant growth chamber with a volume of 5 cu m is described. It is suitable for exposing plants growing either in pots or in beds to known concentrations of pollutants. The temperature and humidity in the chamber are maintained approximately at the level of ambient air by using a fan, an evaporative cooling system, and electrothermal units. Sunlight is used for illumination. Phytotoxicant is introduced through tubes into the blower cabinet and then into the chamber with the circulating air. A single-pass or flow system is employed to obtain a continuous circulation of air and gas mixture in the chamber. (Author abstract)

61182 **APTIC NO. 82471**

Ratnasamy, P.

ELECTRON SPECTROSCOPY OF THE CO-MO-A12O3 CATALYST SYSTEM. *J. Catalysis, 40(1):137-139, Oct. 1975. 9 refs.*

Values of the energy levels of molybdenum and cobalt ions in CO-MO-alumina were measured by electron spectroscopy (ESCA). The catalyst system is used in hydrodesulfurization. Significant features are these: The MIV and MV levels of Mo have practically the same binding energy in molybdenum oxide (NoO3), Mo-Al2O3, and CO-MO-Al2O3, they are broad and merge into each other in the MO-Al2O3 and Co-Mo-Al2O3 samples; in Co-Mo-Al2O3, Co exists in at least three different energy states with binding energies of 780.5, 781.4, and 784.9 eV for the Lm energy level.

61183 **APTIC NO. 84277**

Rausch, Hans, Alpaydin Saatci, Wilhelm Thumm, and Franz Oeters

THE BEHAVIOR OF SULPHUR DURING DIRECT REDUCTION OF IRON ORES WITH THE AID OF COAL. *(Das Verhalten des Schwefels bei der Direktreduktion von Eisenerzen mit Kohle). Text in German. Stahl Eisen (Duesseldorf), 95(26):1266-1272, Dec. 1975. 19 refs.*

The behavior of sulfur in coal during degasification and gasification is discussed, including the nature of gaseous sulfur compounds in iron-sulfur-oxygen, calcium-sulfur-oxygen, and magnesium-sulfur-oxygen systems. The most important reactions of sulfur during the reduction of iron ore in a rotary kiln are discussed. Kinetic considerations for the calculation of the carbonyl sulfide (COS) partial pressure in the gas phase are presented.

61184 **APTIC NO. 83050**

Raynor, Gilbert S.

AEROSOL PRODUCTION BY WASTEWATER SPRAY NOZZLES. *Preprint, Brookhaven National Lab., Upton, N. Y., 27p., 1975. (Presented at the Complete WateReuse: Water s Interface Energy, Air, Solids, Natl. Conf., 2nd. Chicago, Ill., May 4-8, 1975.)*

Aerosol production by wastewater spray nozzles was studied during a series of field tests using sewage and uranine dye sprays. Test nozzles included three sizes of rotating sprayers, one center pivot arm with two sets of three interchangeable nozzles, and one section of a rocker arm with two nozzles. No significant consistent differences were evident between drop size distributions and concentrations from sewage and uranine sprays. The nozzles tested lost only a small portion of thieir liquid output to spray droplets, but all produced large quantities of small aerosols. The number of particles produced was related to wind speed and the length of time the liquid system was exposed to wind.

61185 **APTIC NO. 79665**

Reischel, Michael T. and Gabor Vali

FREEZING NUCLEATION IN AQUEOUS ELECTROLYTES. *Tellus (Uppsala), 27(4):414-427, 1975. 31 refs.*

The extent to which the nucleating abilities of artificial and natural freezing nuclei are influenced by the presence of salts dissolved in water was investigated. Four different nucleants (at fixed concentrations) were tested in combination with 10-20 soluble salts using the drop freezing technique. Changes in freezing temperatures are determined for each nucleant-salt combination at salt concentrations of 0, 0.01, 0.1, and 1 molal. Major differences are noted in the responses of the different nucleants. The influence of dissolved salts on heterogeneous freezing nucleation is not due to changes in the bulk water structure, but results from modifications at the nucleant-embryo interface. The salt contents of cloud droplets alter the ice nucleating activities of suspended particles by as much as + or - 4 C. (Author abstract modified)

61186 **APTIC NO. 80147**

Reischel, Michael T.

ICE NUCLEI FROM REACTIONS INVOLVING LEAD, AMMONIA, AND IODINE. *Atmos. Environ., 9(10):955-958, Oct. 1975. 13 refs.*

The production of ice nuclei from reactions involving lead, ammonia, and iodine was investigated. Drop freezing tests were conducted using Pb compounds as nucleants at a constant concentration of 0.001 g nucleant/g water. One hundred drops of the nucleant solution combination were placed on a silicone resin coated cold state and cooled at a rate of 2.5 C/min. The temperatures at which 10% and 90% of the drops freeze are designated at T10 and T90, respectively. Large changes in supercooling requirements are evident for all Pb compounds at ammonium iodide concentrations greater than 0.01 m. Solutions of 0.1 m potassium iodide failed to enhance the activity of lead oxide. The presence of the ammonium ion greatly increases the number of active ice nuclei formed from lead oxide (PbO) in iodide solutions.

61187 **APTIC NO. 84231**

Riediger, Guenter and Wilfried Coenen

PLANNING OF MEASUREMENTS AND STATISTICAL EVALUATION. (PREREQUISITES, EFFICACY AND LIMITS OF A MODEL). *(Messplanung und statistische Beurteilung. (Voraussetzungen, Wirksamkeit und Grenzen eines Modells). Text in German. Staub, Reinhaltung Luft, 35(12):445-448, 1975. 19 refs.*

It is necessary to know the physical behavior of the parameters to be measured in order to project industrial hygienic measurements and in order to assess the test results. This is particularly true for concentrations of noxious substances which, in order to be assessed, are to be compared with preset limiting values. The consideration of the behavior of the concentration in time combined with the effect of noxious substances on human beings is of decisive importance in this regard. Noxious substances with long-term effects are considered here, and a log normal distribution of the concentrations is assumed. A model for the assessment of individual measurements, developed by the Dust Research Institute, and based on the abovementioned principles, is explained and tested as to its practical applicability. The probability of incorrect assessments, the limitations of application and the reliability of the assumed factors are discussed.

61188 **APTIC NO. 83528**

Riffaldi, Riccardo and Renato Levi-Minzi

ADSORPTION AND DESORPTION OF CD ON HUMIC ACID FRACTION OF SOILS. *Water, Air, Soil Pollut., 5(2):179-184, Dec. 1975. 9 refs.*

The adsorption of ionic cadmium on three humic acids isolated from podzol, rendzina, and brown Mediterranean soils of Tuscany was investigated. The adsorption isotherms were determined at 5 and 25 C. Cadmium adsorption is described by the Langmuir adsorption equation. Langmuir parameters were related to the functional groups content of humic acids and decreased in the following order: rendzina greater than brown Mediterranean soil greater than podzol. Adsorption was independent of temperature and increased with pH. Desorption experiments with 0.1 N NH4OAc and 0.25 M Cu (OAc)2 showed that Cd was adsorbed on humic acid about 50% in an exchangeable form and 50% in coordination complexes. (Author abstract modified)

61189 **APTIC NO. 81907**

Rogers, Robert D.

METHYLATION OF MERCURY IN A TERRESTRIAL ENVIRONMENTAL (ANNUAL REPORT). *Environmental Protection Agency, Las Vegas, Nev., Environmental Monitoring and Support Lab., Program Element 1AA006, ROAP 21BKN, Rept. EPA-600/3-75-014, 18p., Oct. 1975. 24 refs.*

The methylation of applied divalent mercury ion in terrestrial soil systems was examined. The rate of conversion of mercury into methylmercury was dependent on ionic mercury concentration, soil texture, temperature, and soil moisture. After an initial buildup of methylmercury in the soil, there appeared to be a mechanism that decreased the methylmercury content with time. Previous experiments have demonstrated the occurrence of methylmercury in the atmosphere above soils amended with mercuric chloride and, in light of the present findings, illustrate the importance of understanding mercury cycling in terrestrial environments, especially in view of the fact that coal and other fossil fuels are known to contain elevated levels of the element mercury. (Author conclusions modified)

61190 **APTIC NO. 76613**

Rosner, Daniel E.

CORRELATION AND PREDICTION OF BOUNDARY LAYER ENERGY TRANSFER RATES IN THE PRESENCE OF CHEMICAL REACTIONS AND MASS INJECTION. *Combustion Sci. Technol., 10(3/4):97-108, 1975. 29 refs.*

Transpiration cooling data for chemically reacting turbulent boundary layers can be successfully correlated using enthalpy driving forces, provided the energy transfer correlation is based upon the actual nonradiative energy flux at the gas/solid interface, rather than the experimentally accessible flux obtained from the coolant enthalpy rise. Treated in this manner, previous experimental data for turbulent boundary layers of oxyacetylene combustion product gases rich in hydrogen atoms on a porous plate cooled by hydrogen or helium lead to a correlation identical in form to that previously obtained for nonreactive, low speed turbulent boundary layers with dissimilar gas injection at the wall. This suggests a simple and powerful scheme for predicting required transpiration cooling rates in systems for which the effects of chemical reaction and variable properties are important. Similar correlation principles should carry over to laminar or turbulent boundary layers on ablating surfaces since ablation may be fruitfully regarded as a self regulating form of transpiration cooling. The resulting heat transfer coefficient correlations can be used to systematize experimental data or complex computer calculations, and could circumvent the need for lengthy computer calculations in many design applications. (Author abstract)

61191 **APTI NO. 83516**

Sakai, Tomoya, Yoshitaka Kuroda, Seiichi Goto, and Yoshio Yano

CATALYTIC REDUCTION OF NITRIC OXIDE USING METAL COMPLEX. *(Kinzoku sakutai o mochiita issanka chisso no sesshoku kangen). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 29, 1975. 4 refs. (Presented at the Japanese Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D02.)*

The reduction of nitric oxide through nitrous oxide (N2O) to nitrogen was discovered in the Cobalt (II) (Salen)-sodium borohydride system, in DMF medium. The reaction mixture (at 80 C) consisted of 1 mmol NO, 0.1 mmol Co(II) (Salen), and 5 mmol NaBH4, in 30 ml of DMF solution. As NO decreased, N2O and N2 were generated and N2O was completely reduced to N2, at the end of 300 minutes. With NaBH4 alone, in DMF, the reaction with NO generated N2O, but more slowly than when Co(II) (Salen) was present; and N2O was not reduced to N2. The reduction of NO to N2O also occurred in the iron(II) (Salen)-NaBH4-DMF system.

61192 **APTIC NO. 82816**

Sandall, Orville C.

HEAT EFFECTS IN GAS ABSORPTION ACCOMPANIED BY A RAPID FIRST-ORDER REACTION IN TURBULENT LIQUID FILMS. *Can. J. Chem. Eng., 53(6):702-705, Dec. 1975. 6 refs.*

When a gas is absorbed into a liquid and subsequently undergoes a chemical reaction, it is of interest to know the resulting temperature distribution within the liquid due to the combined effects of the heat of absorption and the heat of reaction. It is assumed that the liquid is flowing in turbulent flow with a uniform velocity. The results are restricted to fast reactions, which are the more important case, since the temperature rise at the free surface will be more significant for fast reactions. It is assumed that the heat loses from the liquid to the gas and the liquid to the solid boundary are negligible. Therefore, the calculated temperature rise will represent an estimated maximum. It is assumed that the temperature rise to be calculated is small enough that the first-order reaction rate constant, the gas solubility, and the other physical parameters may be taken to be constant. An equation is derived for the rise in the gas-liquid interface temperature over the bulk liquid temperature due to the heat of solution. An ordinary differential equation for the temperature rise due to the heat of reaction is derived. An expression for the difference between the surface and bulk temperatures is derived from this equation. This expression is integrated to give the rise in free surface temperature over the liquid temperature due to the heat of reaction. An equation is obtained for the increase in liquid phase concentration at the gas-liquid interface compared to the bulk liquid. Another equation is given for calculating the rectant depletion at the interface. The formulas derived are applied to the case of carbon dioxide absorption into an aqueous carbonate-bicarbonate buffer solution with a sodium arsenate catalyst. The temperature rise calculated would not significantly affect the rate of absorption. The depletion of reactant and concentration of product at the free surface will decrease the reaction rate constant at the surface by 4.3% compared to that in the bulk liquid: in this instance. The equilibrium surface concentration of carbon dioxide in this case will be 1.4% higher than the value calculated using the bulk liquid concentrations of carbonate and bicarbonate.

61193 **APTIC NO. 83201**

Sano, Hiroshi, Tomizo Nakamura, Ichiro Toyama, and Tsuneji Tsujitani

REGULARITY IN THE PRODUCT OF O2 AND (CO + H2) IN COMBUSTION EXHAUST GASES. *(Nensho haigasu chu no O2 (CO + H2) seki no kisokusei). Text in*

Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 8, 1975. (Presented at the Japanese Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3C08.)

Log-log plots were made of residual oxygen (%) vs. (carbon monoxide + hydrogen) (%) in exhaust gases from constant combustion conditions. Linear relationships were evident, with slopes of -1. There were also negative slopes (-0.2 to -0.5) present in the log-log plot of nitrogen oxides (ppm) vs. (CO + H2) (%). Log-log plots of residual O2 (%) vs. NOx (ppm) varied with the kind of fuel. A furnace using heavy oil showed a maximum NOx concentration (over 200 ppm), when O2 ranged from 3-5%. With lighter fuels, NOx concentrations increased with increasing values of residual O2, but concentrations reached only 40 ppm, 100 ppm, at 5% residual oxygen. Slopes were positive (mostly from 0.1 to 0.3), and depended on the exhaust source.

61194 **APTIC NO. 83059**

Sano, Taeko and Susumu Kotake

NONEQUILIBRIUM BOUNDARY LAYER FLOWS OF BURNED GAS MIXTURE. *Trans. Japan Soc. Aeronaut. Space Sci., 18(42):181-196, Dec. 1975. 22 refs.*

The problems of increasing thermal efficiencies and reducing pollutant emission of combustors involve boundary layer flows, since the associated processes occur mainly inside a very thin layer near the wall. The implicit finite-difference method of the most rapid convergence and the most favorable stability was investigated to numerically solve boundary layer flows of multicomponent burned gas mixtures with chemical reactions. Boundary layer equations of velocity, temperature, and mass conservation were numerically solved with the computational technique obtained, and the processes of the formation and abatement reactions of nitric oxide, carbon monoxide, and other species in the flow on a noncatalytic wall were studied. Both laminar and turbulent boundary layer flows of the burned gas mixture of n-octane and air were considered. Twenty eight elementary reactions and eleven species were assumed. The concentration distributions in laminar flows were appreciably controlled by the multicomponent diffusion process in addition to the direct effect due to chemical reactions. The concentration distributions in turbulent flows are likely to be uniform across the layer by the turbulent motion and controlled considerably by the multicomponent diffusion process in the region close to the wall. (Author abstract modified)

61195 **APTIC NO. 76548**

Santacesaria, E., D. Gelosa, and S. Carra

INFLUENCE OF CATALYST PRETREATMENT ON N-HEXANE TRANSFORMATIONS ON PLATINUM BLACK. *J. Catalysis, 39(3):403-411, Sept. 1975. 15 refs.*

The hydrogenolysis and skeletal isomerization reactions of n-hexane on platinum-black were studied as a function of thermal pretreatments of catalysts in different atmospheres. The catalytic behavior of Pt, particularly concerning the selectivity towards the above reactions, was found to be very sensitive to the presence of hydrogen or helium in the atmosphere. A simplified kinetic model was devised to describe the time dependence of the isomerization reactions of pretreated catalysts. The model is based on the hypothesis that the activation of the isomerization centers occurs through water removal and that the deactivation is a consequence of the formation of amorphous coke. (Author abstract modified)

61196 **APTIC NO. 80131**

Sasaki, Masahiro, Kazuya Kunii, Hisamoto Aihara, and Saburo Tsutsumi

ON THE COMBUSTION CHARACTERISTICS OF TORCH IGNITION ENGINE: DETERMINATION OF COMBUSTION GAS TEMPERATURE. *(Tochi tenka enjin no nensho tokusei: nensho gasu ondo no sokutei). Text in Japanese. Preprint, Society of Automotive Engineers of Japan, Inc., Tokyo, p. 543-552, 1975. 8 refs. (Presented at the Society of Automotive Engineers of Japan Inc. Lecture Meeting, Kyoto, Oct. 29-30, 1975.)*

The combustion characteristics of a torch ignition engine were investigated. Combustion gas temperatures in main and precombustion chambers were measured by a D-ray inversion method. The principle of spectrum inversion measurement, measurement apparatus, specifications of the optical system, and the combustion gas temperature measurement procedure are given. The combustion gas temperature of the torch ignition engine was highest in the precombustion chamber, followed by the main combustion chambers I and II. The timing for the maximum combustion gas temperature in main chamber I was about 10 CA earlier compared to that of a conventional engine. The maximum combustion gas temperature of the torch ignition engine was higher than that of conventional engines, and the difference was greater at higher air-fuel ratios. In spite of higher combustion gas temperatures, the emission of nitrogen oxides was less, which was considered to be characteristic of stratified combustion. The high temperature at the initial period of combustion was attributed to the combustion of an air-fuel mixture with a higher fuel ratio.

61197 **APTIC NO. 76134**

Satterfield, Charles N., Michael Modell, Jerome F. Mayer, and Joseph F. Cocchetto

CATALYTIC DESULFURIZATION AND DENITROGENATION (FINAL REPORT). *Massachusetts Inst. of Tech., Cambridge, Dept. of Chemical Engineering, Environmental Protection Agency Grant R-800897, Program Element 1AB013, ROAP 21ADD-053, Rept. EPA-600/2-75-063, 66p., Oct. 1975. 41 refs.*

The catalytic hydrodesulfurization and hydrodenitrogenation of thiophene and pyridine, model compounds which represent some of the less reactive organosulfur and organonitrogen compounds, respectively, was studied in a flow microreactor at temperatures of 200-500 C and at pressures of 4.4 and 11.2 bars on commercial catalysts. Pyridine inhibited the hydrodesulfurization of thiophene, whereas thiophene exerted a dual effect on the hydrodenitrogenation of pyridine. At low temperatures, thiophene inhibited the reaction by competing with pyridine for hydrogenation sites on the catalyst. This retarded the hydrogenation of pyridine to piperidine, reducing the overall reaction rate. At high temperatures, the dominant effect was the interaction of hydrogen sulfide, a hydrodesulfurization product, with the catalyst to improve its hydrogenolysis activity. This increased the rate of piperidine hydrogenolysis which was rate-determining and enhanced the overall rate of hydrodenitrogenation. (Author summary modified)

61198 **APTIC NO. 84147**

Schlipkoeter, H. W. and K. H. Friedrichs

THE SIGNIFICANCE OF FIBROUS DUST ON HEALTH AND THE METHOD OF MEASURING ITS EFFECT. *(Die gesungheitliche Bedeutung faserfoermiger Staeube und ihre messtechnische Erfassung). Text in German. Klima Kaelte Ing., 3(11):359-362, Nov. 1975.*

Medical research on carcinogenicity of fibers and on the determination of fiber mixtures with various measuring techniques has left too many unanswered questions, which preclude the development of pertinent guidelines. However, current knowledge is sufficient for recommendations concerning the emission or active release of fibers from filters, sound absorbent material, and waste heat recovery systems. The retention capacity of B2, C and S filters for fibrous aerosols should be adequate to eliminate fibers in the atmosphere and in plants. Natural, chemical and industrial fibers are analyzed by electron microscopy, and their effects on cell cultures and the influence of diameters are examined.

61199 **APTIC NO. 83302**

Schoeneborn, Paul-Richard

MOVEMENT OF INDIVIDUAL PARTICLES IN THE NON-STATIONARY FLOW FIELD. *(Bewegung einzelner Partikel im instationaeren Stroemungsfeld). Text in German. Chem.-Ing.-Tech., 47(7):305, 1975. 7 refs. (The full-length text can be obtained from: Verlag Chemie GmbH, Weinheim, Postfach 1260, West Germany).*

The movement of individual spherical particles in a flow field pulsated harmonically at frequencies of 4-50 cps at amplitudes of 2-10 mm was studied by a photographic method. The particles have Reynolds numbers of 8-800 relative to a stagnant liquid. Flow field frequencies within the range of that of the natural vortex separation influenced the motion after vortex shedding considerably, and reduced the mean sinking speed by up to 30%. Sufficiently high frequencies suppressed the vortex shedding completely.

61200 **APTIC NO. 82500**

Schwarcz, Joseph M., William M. Malone, and Saul Blinder

RATE OF SMOKE EVOLUTION FROM BURNING POLYMERIC MATERIALS. *J. Fire Flammability, vol. 6:554-568, Oct. 1975. 19 refs.*

A new equation giving the variation of smoke quantity as a function of time was developed. The equation is based on a kinetic model which has relatively few assumptions and is applicable, in principle, to experimental data obtained from smoke measuring instruments of any type. Various currently used ways to report smoke data were expressed as functions of time by means of this new general equation. The simultaneous measurement of light obscuration and sample weight which is necessary for the determination of mass optical densities can be avoided. The equation was applied to the combustion of polyvinyl chloride samples in the National Bureau of Standards Smoke Density chamber. Good agreement was obtained between the experimental and calculated data. (Author summary modified)

61201 **APTIC NO. 76368**

Seader, J. D. and W. P. Chien

PHYSICAL ASPECTS OF SMOKE DEVELOPMENT IN AN NBS SMOKE-DENSITY CHAMBER. *J. Fire Flammability, 6(3):294-310, July 1975. 23 refs. (Presented at the Polymer Conference Series on Flammability of Materials, 1974, Salt Lake City, Utah, July 8-12, 1974.)*

Physical aspects of smoke development in a National Bureau of Standards Smoke Density Chamber are considered quantitatively. A primitive theory for utilizing these aspects to predict the degree of light extinction is developed. The theory involves a new smoke parameter termed the particulate optical density (POD). Required information for application of the theory includes particle size distribution and properties as well as smoke concentration. The theory considers light scattering droplet agglomeration, droplet settling, multiple scattering, and polydispersion. Required information for application of the theory includes particle size distribution and properties as well as smoke concentration. (Author abstract modified)

61202 **APTIC NO. 81879**

Shen, Chi-Hung and George S. Springer

OZONE AND PARTICULATE FORMATION IN PHOTOCHEMICAL REACTIONS (FINAL REPORT). *Michigan Univ., Ann Arbor, Office of Air and Waste Management Grant R-801476, Rept. EPA-460/3-76-005, 136p., April 1975. 70 refs.*

NTIS: PB 251587/AS

The photochemical formation of nulcei and aerosols in sulfur dioxide and air mixtures as well as the formation of ozone, nuclei, and aerosols in mixtures of cyclohexene, nitrogen dioxide and air was investigated using ultraviolet radiation and a pyrex tubulation device. The maximum number of nuclei varied directly with the SO2 concentration and with the square of the relative humidity during the photooxidation of SO2-air mixtures for initial SO2 concentrations ranging from 0.2-1 ppm and relative humidities ranging from 25-100%. The amount of aerosol produced in the above mixture was negligible. The maximum amount of ozone formed in cyclohexene-NO2-air mixtures was directly proportional to the square root of the initial cyclohexene concentration, the square root of the initial NO2 concentration, and the square root of the light intensity. The maximum number of nuclei varied directly with the square root of both the cyclohexene and the NO2 concentrations. The production of aerosols in the cyclohexene-NO2-air mmixture appeared to depend only on the ratio of the initial concentrations of cyclohexene and NO2. The amount of aerosol formed seemed to be insensitive to the NO2 concentration within the accuracy of the measurements. (Author conclusions modified)

61203 **APTIC NO. 79769**

Sheppard, C. G. W.

A SIMPLE MODEL FOR CARBON MONOXIDE OXIDATION IN GAS TURBINE COMBUSTORS. *Combust. Sci. Technol., 11(1-2):49-56, 1975. 11 refs.*

A simple model for carbon monoxide in gas turbines is developed. For typical engine idling and full power conditions the model examines the effect of the parameters equivalence ratio, residence time and degree of mixing on both the equilibrium carbon monoxide concentration and the approach to this level within the various regions of the combustor. The model is largely intended to be interpretive rather than predictive, but the curves presented enable reported tends in CO emission levels to be qualitatively followed with the above parameters. Carbon monoxide emission levels at idling can be reduced by adoption a well mixed recirculation zone operating with an equivalence ratio of approximately 0.7. (Author abstract modified)

61204 **APTIC NO. 84623**

Shibuya, Katsuo and Tsunekazu Nagashima

DETERMINATION OF GASEOUS NO3 IN THE PHOTOCHEMICAL REACTION SYSTEM OF HC-NO-AIR. *(HC-NO-kukikei deno kokagaku hanno ni okeru gasujo NO3 no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):624, 1975. (Presented at Japan. Soc. of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 357.)*

The gaseous nitrate produced during the reaction of propylene and nitric oxide (NO) in air was studied. Twelve ppmc propylene and up to 67 ppm NO were added to an 0.5 liter pyrex glass vessel and balanced by air. The reaction vessel was irradiated with a mercury lamp for two hours. After the reaction period, 50 ml of ethyl alcohol were added to the glass vessel. The mixture was shaken to allow the ethyl alcohol to absorb the nitrate produced. The ethyl alcohol solution was then analyzed for nitrate ion content by the xylenol method. Seven ppm nitrate was produced from the reaction with 12 ppmc propylene; 4 ppm nitrate was produced from the reaction with 4 ppmc propylene. The trapping efficiency of nitrate with ethyl alcohol was nearly 100% when the shaking time was longer than 10 minutes.

61205 **APTIC NO. 82921**

Shinoyama, Eiichi, Shigeru Yanagihara, Sasmu Shimada, Keizo Saito, Fumitake Chisaka, and Takeshi Ishii

BEHAVIOUR OF INDIVIDUAL HYDROCARBON IN PHOTOCHEMICAL REACTIONS OF AUTO-EXHAUST. *(Kokagaku hanno ni okeru kaku tankasuiso no kyodo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):264, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 1.)*

The photochemical reaction of hydrocarbons in automobile exhaust gas is described. The exhaust gas from a four cycle engine was irradiated with an ultraviolet ray up to 6 hr. Four l of the reacted gas was concentrated onto a concentration column cooled by liquid nitrogen, from which hydrocarbons were analyzed by gas chromatography. There were about 70 peaks observed on the chromatogram. With an initial exhaust gas composition of 0.8 ppm total hydrocarbons and 0.137 ppm nitrogen oxides in the smog chamber, benzene, iso-pentane, acetylene, toluene, n-octane, ethylene, cyclohexane, xylene, and propylene levels exponentially decreased with increased irradiation time; these levels remained, after 6 hr irradiation, at 70, 44, 38, 32, 30, 26, 22, 16, and 8% of their initial levels, respectively. The concentration ratio between total hydrocarbons and NOx after 6 hr irradiation was 5.84. The remaining percentage of saturated hydrocarbons and aromatic hydrocarbons increased with increased initial concentration of total hydrocarbons in the chamber.

61206 **APTIC NO. 83249**

Shio, H.

A MODEL EXPERIMENT OF THE POLLUTED AIR FLOWS OVER A HEAT ISLAND IN AN INVERSION LAYER. *(Sumogu gensho no moderu jikken). Text in Japanese. Tenki (Weather), 22(11):17-19, Nov. 1975. 1 ref.*

A model experiment on smog flow patterns was conducted to check the dispersion and distribution of smog over a heat island in the inversion layer which causes regional high concentrations of pollutants. The experiment was conducted in a circulating air box, 2 by 2 by 1 m. In the upper portion an air flow of 0-8 m/s was introduced. A heater was placed at the center bottom of the box to simulate the heated center of a metropolitan area and rubber tubes containing cool water at 2 C were placed around the heat island to simulate the cooled outskirts of the city. The inversion layer was simulated by introducing a gas mixture of 1-2 C which contained carbon dioxide made by heating dry ice and smoke made by heating paraffin oil to the center bottom of the box. The gas temperatures near the heat island and the cooled outskirts were 16 C and 4 C respectively, and the air temperature near the bottom and above the inversion layer were 2 C and 14-16 C, respectively. The smog flow pattern observed by the experiments indicated that pollutants in a metropolitan area released in the inversion layer during the daytime will shift into the suburbs at night, and that clear air circulation is present above the metropolitan area during the night.

61207 **APTIC NO. 80304**

Skotnickl, Peggy A., Alfred G. Hopkins, and Chris W. Brown

TIME DEPENDENCE OF QUANTUM YIELD FOR THE PHOTOOXIDATION OF SULFUR DIOXIDE. *J. Phys. Chem., 79(22):2450-2452, Oct. 23, 1975. 8 refs.*

Quantum yields for the photooxidation of sulfur dioxide were studied in a static system as a function of time using Raman bands of SO2 and sulfur trioxide to determine the extent of reaction. The quantum yields decreased during the first 5-10 yr. This decrease was due both to the formation of a film on the walls of the reaction cell and to a back reactions. (Author abstract modified)

61208 **APTIC NO. 80452**

Smalley, Richard E., Lennard Wharton, and Donald H. Levy

THE FLUORESCENCE EXCITATION SPECTRUM OF ROTATIONALLY COOLED NO2. *J. Chem. Phys., 63(11):4977-4989, Dec. 1, 1975. 31 refs.*

The fluorescence excitation spectrum of nitrogen dioxide was measured in the region 5708-6708 A using a tuneable dye laser as an excitation source. The NO2 was cooled to a rotational temperature cf 3 K by expansion with argon as a carrier gas through a supersonic nozzle. This cooling drastically reduced the rotational structure and permitted a clear separation and analysis of 140 vibronic bands found in this 1000 A region of the spectrum. Most of the fluorescence in the region is due to a 2B2 electronic state. This state is so heavily perburbed by high lying levels of the ground electronic state that a substantial fraction of all ground state levels of appropriate vibronic symmetry in this region have appreciable fluorescence intensity. (Author abstract modified)

61209 **APTIC NO. 80329**

Stakebake, J. L.

THE PHYSICAL ADSORPTION OF 1,1,1-TRICHLOROETHANE ON URANIUM DIOXIDE. *J. Catalysis, 39(3):463-470, Sept. 1975. 14 refs.*

Adsorption isotherms of 1,1,1-trichloroethane adsorption on uranium dioxide were obtained gravimetrially in the temperature range 0-30 C. Adsorption data were evaluated using the BET and Clausius-Clapeyron equations and the potential theory of adsorption. The heat of adsorption varies between 12 and 8 kcal/mole, depending upon the coverage. Using the BET equation the size of the adsorbed CH3CCl3 molecule is 33 + or - 5 sq A. (Author abstract)

61210 **APTIC NO. 80484**

Steiner, L., J. F. Ballmer, and S. Hartland

THE STRUCTURE OF GAS-LIQUID DISPERSIONS ON PERFORATED PLATES. *Chem. Eng. J. (Netherlands), 10(1):35-40, Aug. 1975. 12 refs.*

The dependence of the dispersion porosity on the height above a perforated plate was directly measured using an improved gamma-ray absorption technique. Good agreement between experiment and the theory of Kolar was found for cellular foams. For froths, the actual porosity profiles were more complicated than those predicted by the theory which neglects the layer of clear liquid existing just above the plate. (Author abstract)

61211 **APTIC NO. 80483**

Stepanek, J. B. and S. K. Achwal

TURBULENT ABSORPTION WITH INSTANTANEOUS IRREVERSIBLE CHEMICAL REACTION. *Chem. Eng. J. (Netherlands), 10(1):49-56, Aug. 1975. 10 refs.*

A model of damped turbulence near a gas liquid interface was used in an analysis of mass transfer in absorption with an instantaneous chemical reaction in a liquid. Formulas were obtained for the enhancement factor in absorption with instantaneous chemical reaction into a turbulently flowing liquid. These formulas take into account the damping of velocity fluctuation near to the interface. Simplified formulas can be substituted for the exact solution without any significant error as long as the reaction plane does not lie too close to the edge of the diffusional sublayer. (Author abstract modified)

61212 **APTIC NO. 84606**

Suzuki, Masayuki and Naoko Seki

ACTINOMETRY OF ULTRAVIOLET RADIATION ON THE GROUND. *(Chijorakka shigaisen ryo no sokutei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):621, 1975. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 16th, Niigata, Nov. 5-7, 1975, Paper 353.)*

Ultraviolet light at ground level was measured using an actinometer at 36 deg 6 min north latitude and 140 deg 5 min east longitude. The range of wavelengths measured was between 300 and 400 nm. Monitoring was conducted for 5 years, to determine seasonal variation. The yearly trend was similar to the average daily maximum in July and the minimum in December. The theoretical expectation was that the maximum would occur in June, when the solstice occurs; however, the daily ultraviolet in June was less than in July or May. This was attributed to rainy days in June. The daily average in July was 23 cal/sq cm/day; in December, it was 9 cal/sq cm/day.

61213 APTIC NO. 78194

Suzuki, Shin, Nobutoshi Horiuchi, and Naoaki Fukuda

STUDIES ON PHOTOCHEMICAL REACTIONS IN TOLUENE-SULFUR DIOXIDE GAS SYSTEM. *(Toruenaryusan gasu kei no kokagaku hanno ni kansuru kenkyu). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), no. 2:75-79, March 1975. 1 ref.*

A high-pressure mercury lamp was used to irradiate toluene, or a toluene-sulfur dioxide system, in reaction tubes made of quartz or pyrex. In the case of toluene alone, reaction products were obtained only in the quartz reaction tube. The major products included methane, ethane, benzene, and ethylbenzene. When SO2 gas was added to toluene, reactions occurred in both pyrex and quartz reaction tubes, with the same resultant major reaction products. However, in the pyrex reaction tube, more ethylbenzene and less benzene were formed. A brown liquid formed on the inner walls of the reaction tubes, but could not be analyzed by F.I.D. gas chromatography. As amount of SO2 added to the system was increased, (toluene:SO2, from 1:0.5 to 1:4), formation of benzene decreased. Sulfur dioxide may act as a light sensitizer which promotes toluene decomposition, and promotes radical formation which could lead to aerosol (brown liquid) formation in the atmosphere.

61214 APTIC NO. 80112

Suzuki, S.

ATMOSPHERIC CHEMICAL REACTION. PART 5. PHOTOCHEMICAL REACTION OF NITROGEN OXIDES-HYDROCARBON (CONTAINING ALDEHYDE). *(Taiki kagaku hanno. Dai 5 Kai. Chisso sankabutsu-tankashiso (arudehido o fukumu) keo no kokagaku hanno (2)). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst. (Tokyo), 18(11):1012-1019, Nov. 1975. 153 refs.*

As a part of studies on atmospheric chemical reactions, photochemical reactions of nitrogen oxides-hydrocarbon systems are reviewed. Olefins, aromatic HC and paraffins are considered to the most important HC from the standpoint of photochemical reactions. As an example of reactions of NOx-olefin systems, photochemical reactions of the NOx-propylene system are reviewed, including additon reaction by oxygen, hydrogen extraction reaction by O, addition reaction by ozone, addition reaction by HO radical, and addition reaction by HO2 radical. Effects of the addition of water and carbon monoxide to NOx-propylene systems and photochemical reactions of NOx- methane systems are also reviewed. Reviews of atmospheric photochemical reactions are also given.

61215 APTIC NO. 84191

Suzuki, Shin, Kazuo Matsumoto, Noritoshi Horiuchi, and Harukuni Sato

FUNDAMENTAL STUDIES ON METAL CORROSION BY AIR POLLUTANTS. *(Taiki osenbutsu ni yoru kinzoku fushoku ni kansuru kisoteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):280, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 17.)*

The corrosion of a copper plate by nitrogen dioxide and sulfur dioxide with and without moisture was studied. Copper was electroplated on an acrylonitrile-butadiene-styrene plate that was attached to a micro-balance within a glass vessel, and vacuumed to 0.005 mm Hg. Nigrogen dioxide up to 450 mm Hg or SO2 up to 500 mm Hg, with and without 10 mm Hg water, were added, and the increase in the weight of the copper plate was measured with an exposure time of up to 10 hr at room temperature. The copper plate corrosion increased with increased NO2 concentration in the vessel. The corrosion by NO2 was more than by SO2. The presence of water increased corrosion by SO2, but did not affect corrosion by NO2. The increased weight of the copper plate after the 3-hour exposure was 0.12 g/4.50 sq m plate for the 450 mm Hg NO2, 0.01 g for 500 mm Hg SO2 with 10 mm Hg water, and less than 0.002 g for 500 mm Hg SO2 without water. For the exposure of the mixed NO2 and SO2 gases, the corrosion depended on the order of the gas additions to the vessel. Whenever NO2 was first added to the vessel before SO2 addition, the corrosion was greater than when SO2 was first added to the vessel. Auger electron spectrometry was also used to examine the corrosion of the copper plate, and results were similar to those obtained from the weighing method.

61216 APTIC NO. 84634

Takahashi, Kanji, Mikio Kasahara, and Masayuki Ito

AEROSOL FORMATION FROM THE PHOTOCHEMICAL OXIDATION OF SULFUR DIOXIDE. V. EFFECTS OF IONS. *(SO2 no kokagakuteki sanka ni yoru earozoru seisei (5). Ion no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):130, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975.)*

The formation of sulfuric acid mist in the presence of krypton-85 ions was studied in the presence of sulfur dioxide-filled chamber experiments. The parameters considered were humidity, irradiation time, and SO2 concentration. The ion concentration in the chamber was 10 to the 6th ions/cu cm. With this concentration and 10% relative humidity, the theoretical expectation of the formation rate of sulfuric acid mist particles was from 10 to the 4th to 10 to the 5th/cu cm; the observed value was 6 times 10 to the 4th/cu cm. No significant correlation was found between the sulfuric acid mist and the krypton ions injected.

61217 APTIC NO. 79765

Tejwani, G. D. T. and Edward S. Yeung

PRESSURE-BROADENED LINEWIDTHS OF NITROGEN DIOXIDE. *J. Chem. Phys., 63(10):4562-4564, Nov. 15, 1975. 28 refs.*

The self-and foreign-gas-broadened linewidth calculations for the transitions in nitrogen dioxide bands were determined using computer programs. There is appreciable variation with respect to the quantum numbers. Weighted mean linewidths of NO2 broadened by nitrogen, oxygen, air, and NO2 at 300 K and by N2, 02, and air at 200 K are tabulated. The averaging over self-broadened linewidths is restricted to a rather limited number of transitions. Weighting is done with respect to the relative intensity of the transition. Published estimated average self-broadened linewidth for the v3 band of NO2 is in good agreement with the corresponding value for the type A band.

61218 APTIC NO. 73416

Todo, Naoyuki, Hisashi Ueda, and Yasushi Kannan

DENITRIFICATION REACTION OF PYRIDINE BY GAMMA-ALUMINA SUPPORTED CATALYST. *(Ganma arumina tanji shokubai ni yoru pirijin no datsu chisso hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 499, 1975. (Presented at the Japan Chemical Society Spring Term Annual Meeting, 32nd, Tokyo, Japan, April 1-4, 1975, Paper 3K46.)*

The hydrogenation decomposition of pyridine by molybdenum, cobalt, and nickel oxides loaded on gamma-alumina is studied. The pyridine saturated hydrogen gas was passed through the catalyst bed, and the pyridine concentration at its outlet was measured. A reaction temperature above 500 C was necessary to decompose pyridine. When gamma-alumina with 11% molybdenum oxide was used, 86% of the initial pyridine was decomposed. The decomposition by the 5.6% cobalt oxide loaded on alumina was 97% and that by 1.8% nickel oxide on alumina was 100%. When a pair of metal oxides was loaded on the same gamma-alumina, a synergistic effect resulted. Decomposition of 100% was obtained by a catalyst loading of 5.2% molybdenum oxide and 1.3% nickel oxide, or 5.6% molybdenum oxide and 4.2% cobalt oxide on gamma-alumina.

An electron spin resonance study of the used nickel oxide catalyst indicated the presence of Ni (+ 1).

61219 **APTIC NO. 83702**

Todo, Naoyuki, Minoru Kurita, Hiroyuki Hagiwara, Hirobumi Ueno, and Toshio Sato

FACTORS WHICH AFFECT DURABILITY OF NOX REDUCTION CATALYSTS IN NH3 METHOD. *(NH3 ho NOx kangen shokubai no jumyo ni eikyo suru inshi). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 38, 1975. (Presented at the Japanese Chemical Society, Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3D11.)*

Deterioration of catalyst activity in the presence of sulfur oxides was studied for copper oxide, iron oxide (Fe2O3), vanadium pentoxide (V2O5), catalysts (10 wt%) supported on gamma-aluminum oxide. A synthetic gas mixture (200 ppm nitric oxide, 4% oxygen, 10% steam, 500-1000 ppm sulfur dioxide, balance nitrogen) and boiler exhaust gas containing 450-500 ppm SOx were used in experiments lasting about 1000 hr. When a synthetic gas mixture without SO2 was used, there was no change in the NO conversion rate for all 3 types of catalysts, at 320 C and SV 10,000 after 500 hr. The formation of V(+4) from V2O5, increasing with time, was discerned, even in the presence of 4% O2. When SO2 was present, the deterioration of catalyst activity occurred most for CuO, then Fe2O3, then V2O5. Formation of NH4Al(SO4)2 on V2O5 catalyst; aluminum sulfate (Al2(SO4)3) on CuO-Fe2O3 system catalyst; and copper sulfate on CuO catalyst was found by X-ray analysis. In Fe-V systems, a decrease in the amount of addition of NH3 caused a lowering of activity.

61220 **APTIC NO. 83197**

Toyama, Ichiro, Tomizo Nakamura, Hiroshi Sano, and Tsuneji Tsujitani

SINGULARITY OF HYDROGEN FUEL IN TOTAL AIR RATIO/PRIMARY AIR RATIO DEPENDENCE OF NOX. *(NOx no izonsei ni yoru suiso nenryo no tokuisei). Text in Japanese. Preprint, the Chemical Society of Japan, Tokyo, p. 7, 1975. 2 refs. (Presented at the Japanese Chemical Society Fall Meeting, 33rd, Fukuoka, Oct. 17-20, 1975, Paper 3C07.)*

The formation of nitric oxide (NO) was studied, when constant amounts of primary air and secondary air were supplied in the combustion of isocalorific amounts of hydrogen, city gas, propane gas, methane gas, and carbon monoxide. The gaseous fuels were burned at a rate of 13 kcal/min. For the combustion of hydrogen, the maximum NO concentration was 300 ppm. In decreasing order of magnitude, maximum NO concentrations were found for carbon monoxide, methane (100 ppm), city gas, and propane. The influence of secondary air on NO formation was slight for all fuels. With hydrogen, the maximum NO formation occurred when the primary air ratio was less than 0.1, and the total air ratio (primary + secondary air) was about 1.2. For the other fuels, maximum NO concentrations occurred when the primary air ratio was about 0.3. As the primary air ratio increased, NO formation decreased for hydrogen, but increased for methane.

61221 **APTIC NO. 76588**

Trung, Quac Le, Donald Mackay, Akira Hirata, and Olev Trass

A SHOCK TUBE STUDY OF THE THERMAL DECOMPOSITION OF NITRIC OXIDE. *Combust. Sci. Technol., 10(3/4):155-162, 1975. 24 refs.*

Nitric oxide decomposition was studied in a shock tube time of flight mass spectrometer system at 2700 to 4700 K and 1.5 to 3.5 atm using neon as diluent. The overall decomposition rate is second order in NO concentration and in good agreement with previously reported rates. The only observed reaction products are nitrogen and oxygen molecules and O-atoms. A mathematical simulation of the reaction consisting of eight elementary reactions is deduced by fitting experimental data to simulated concentration time profiles. (Author abstract modified)

61222 **APTIC NO. 80237**

Tuttle, J. H., R. A. Shisler, R. W. Bilger, and A. M. Mellor

EMISSIONS FROM AIRCRAFT FUEL NOZZLE FLAMES (FINAL REPORT). *Purdue Univ., West Lafayette, Ind. School of Mechanical Engineering, Environmental Protection Agency Grant R-802650-01, Rept. PURDU-CL-75-04, 139p., July 1975. 48 refs.*

The atomization of liquid fuel prior to combustion is discussed, including the droplet size distribution. The experimental combustion facility consisted of two burners in series. The upstream combustor was used only to supply high temperature vitiated inlet air to the downstream test section. Both burners were fueled with liquid propane. The complex physical processes occurring both within the disc stabilized burner and within a conventional gas turbine combustor are analyzed and time scale parameters developed. Internal combustor measurements of hydrocarbons, carbon monoxide, nitrogen oxides, and gas temperature for three widely varied operating conditions are presented and discussed. Exhaust plane measurements of the pollutants were also made. Results indicate that with a well atomized fuel spray the large scale turbulent mixing controls the flame stoichiometry and hence the emissions characteristics. However, as the fuel atomization becomes poorer, the flame structure is altered and emissions characteristics can be explained only by a combination of heterogeneous and homogeneous processes. Because CO and NOx emissions originate in separate regions of the flame, it was possible to alter the turbulent mixing properties of each region such that both CO and NOx emissions were reduced simultaneously. (Author abstract modified)

61223 **APTIC NO. 83023**

Twomey, S.

COMPARISON OF CONSTRAINED LINEAR INVERSION AND AN ITERATIVE NONLINEAR ALGORITHM APPLIED TO THE INDIRECT ESTIMATION OF PARTICLE SIZE DISTRIBUTIONS. *J. Comput. Phys., 18(2):188-200, June 1975. 4 refs.*

An iterative nonlinear algorithm is compared with the use of constrained linear inversion for indirectly estimating particle size distributions. Particle size distributions in the atmosphere are not smooth, and the applicationn of the usual smoothing constraints to the inversion of indirect measurements of such distributions is unsuccessful for this reason, even though the method is successful for hypothetical (but unreal) distributions. Nonlinear iterative procedures can be applied successfully in either situation. An iterative nonlinear algorithm possesses advantages over and the more familiar and more direct inversion methods when the object function and the measurements extend over a wide dynamic range. Stability is achieved by the process itself since a smooth initial guess is multiplied by smooth adjusting functions at each step. This method is, however, considerably slower than constrained linear inversion, requiring about five times more computing time. (Author abstract modified)

61224 **APTIC NO. 79660**

Ueda, Shigeru, Shinichi Yokoyama, Tadao Ishii, Kazuo Makino, and Gen Takeya

THE HEAT OF HYDRODESULFURIZATION REACTION OF HEAVY OIL. *Ind. Eng. Chem. Process Design Develop., 14(4):493-497, Oct. 1975. 12 refs.*

The heat of hydrodesulfurization reaction of heavy oil was measured between 425 and 440 C under 200 kg/sq cm using an apparatus for differential thermal analysis (DTA) under high pressure. A new method was developed involving rapid starting of the reaction by charging with hydrogen and simultaneous stirring of the sample when the sample reaches the desired

temperature. The heats of reaction obtained for five samples range from 5-54 cal/g with a deviation less than 10%. (Author abstract modified)

61225 APTIC NO. 83032

Voorhoeve, R. J. H., C. K. N. Patel, L. E. Trimble, and R. J. Kerl

HYDROGEN CYANIDE PRODUCTION DURING REDUCTION OF NITRIC OXIDE OVER PLATINUM CATALYSTS. *Preprint, Bell Telephone Labs., Inc., Murray Hill and Holmdel, N. J., 18p., 1975 (?). 21 refs.*

The production of hydrogen cyanide resulting from the catalytic reduction of nitric oxide with carbon monoxide and hydrogen was studied with a bench-scale flow reaction at 400-800 C over platinum. Up to 80 ppm HCN was formed over Pt at 600-800 C in mixtures of NO, CO, H2, and water vapor, with all concentrations being in the range of 0.1-5%. In the absence of H2O the HCN level rose to 700 ppm. Hydrogen cyanide production was suppressed to a level of less than 5 ppm with the addition of 6-60 ppm sulfur dioxide to the gas. No significant differences were observed between a platinum sponge and platinum supported on cordierite. The results suggest the need for determinations of HCN in catalytically treated automotive exhaust. (Author abstract modified)

61226 APTIC NO. 83487

Wagner, Paul E.

THE INTERDEPENDENCE OF DROPLET GROWTH AND CONCENTRATION. II. EXPERIMENTAL TEST OF DROPLET GROWTH THEORY. *J. Colloid Interface Sci., 53(3):439-446, Dec. 1975. 22 refs.*

Simultaneous measurements of droplet radius, droplet concentration, and gas pressure in a pressure-defined expansion cloud chamber and reported. The condensing droplets were illuminated by a laser beam and the light scattered under a selectable fixed scattering angle was monitored during droplet growth. The light scattering curves showed a series of maxima and minima in good agreement with mie theory. From the positions of the light scattering peaks with respect to the time axis droplet radius at certain times and from the height of the maxima, droplet concentrations were evaluated during the growth process. Droplet growth curves were measured for various droplet concentrations and initial supersaturations. Good agreement with the previously reported droplet growth theory was obtained. The computed time course of supersaturation during droplet growth showed that the measured expansion time of 5 msec secured approximately dry adiabatic conditions up to droplet concentrations of 10 to the 5th power/cu cm. (Author abstract modified)

61227 APTIC NO. 83488

Wagner, Paul E. and Franz G. Pohl

THE INTERDEPENDENCE OF DROPLET GROWTH AND CONCENTRATION. I. THEORY OF DROPLET GROWTH AND APPLICATIONS ON CONDENSATION NUCLEI COUNTERS. *J. Colloid Interface Sci., 53(3):429-438, Dec. 1975. 29 refs.*

Theoretical investigations on droplet growth in monodisperse droplet ensembles are described. Computations are based on diffusion theory of single droplet growth. The mutual influence of growing droplets was taken into account by introducing slowly varying gas temperature and vapor pressure. The time course of droplet radius, gas temperature, and saturation ratio were evaluated numerically. Stoppage of droplet growth at a terminal size was predicted dependent on droplet concentration and initial supersaturation. Gas temperature rose and saturation ratio decreased during droplet growth due to vapor consumption and heat production by the growth droplets. Based on computed droplet growth curves the response of condensation nuclei counters was investigated. Conditions for minimal counting losses and linear response are given. (Author abstract modified)

61228 APTIC NO. 76554

Wakamatsu, S.

RELATIONSHIP BETWEEN THE PERCENTILE VALUE OF SULFUR OXIDES CONCENTRATION AND ANNUAL MEAN. *(Iou sankabutsu nodo no pasentairu chi to nen heikinchi no kankei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(2):73-76, 1975. 5 refs.*

The cumulative frequency distribution of sulfur oxides in terms of C plus C prime, where C is the original data of sulfur oxides and C prime is a constant value obtained by the least mean square method from the curve of cumulative frequency distribution plotted on lognormal probability paper, shows approximately lognormal distribution. The application of this method to the estimation of the annual mean value is described. In the case of the environmental mental standard given in terms of one hour average concentration, the relationship between the one hour average and annual average has to be known. Methods for obtaining the annual mean, geometric mean, logarithmic standard deviation and cumulative frequency distribution curve, which satisfy the specific standard value and percentile frequency, from measured data of mean concentration and cumulative frequency distribution are described. The acceptable level of annual mean concentration for specific environmental standards are also discussed.

61229 APTIC NO. 83137

Walz, Geza

EXPLOSIVE AIR CONTAMINATIONS. *(Robbanasveszelyes legszennyezodesek). Text in Hungarian. Elelmezesi Ipar, 29(10):307-309, Oct. 1975. 5 refs.*

Standard definitions are given of flash point, ignition point, and explosion limits with respect to gases, vapors, and particulates in air. The lower explosion limit of particulates in air is dependent on the ignition point, initial temperature, specific heat, combustion heat, and particle size. To prevent the explosions due to explosive mixtures and particulates, the gas, vapor and dust concentrations should not exceed a certain fraction of the lower explosion limit concentration, and energy transfer should be prevented. Nets, water seals or other safety devices should be installed.

61230 APTIC NO. 82236

Washida, Nobuaki and Kyle D. Bass

OXIDATION REACTIONS OF METHYL RADICALS. *(Mechiru rajikaru no sanka hanno). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 43-45, 1975. (Presented at the Japan Chemical Society Lecture Meeting on High-Speed Reaction, 10th, Fukuoka, Japan, Oct. 19-20, 1975, Paper 4K01.)*

Reaction rates at temperatures ranging from 259-341 K, for reactions of methyl radicals with oxygen atoms and oxygen molecules, were obtained by using a combination of fast-flow-reactor and photoionization mass analyzer for direct detection of methyl radicals. Light source for photoionization was the resonance line for krypton, hydrogen, and argon. Methyl radicals were generated by the reaction of ethylene with oxygen atoms, generated by the microwave discharge of O2/He. The flow rate of gases in the reactor ranged from 15.0-23.2 m/sec. In the reaction of oxygen atoms and ethylene, more than 95% of the products are CH3 and CHO radicals. If excess oxygen atoms are present in the system, they react with CH3 radicals to form formaldehyde and hydrogen atoms. Reaction rates of oxygen molecules and methyl radicals were determined from the consumption of methyl radicals when oxygen molecules were added to the reaction system. The disappearance of methyl radicals is the result of competition reactions between oxygen atoms and oxygen molecules, and can be described by a Stern-Volmer type of equation. Rate constants were calculated.

61231 **APTIC NO. 82974**

Weber, Jean and Jean Moussou

TUNNEL-KILN FOR THE HEAT TREATMENT OF PRODUCTS HAVING A CIRCULAR CROSS SECTION. *(Ceraver, Paris (France)) U. S. Pat. 3,887,327. 12p., June 3, 1975. 4 refs. (Appl. April 25, 1974, 13 claims).*

A tunnel kiln for the heat treatment of products having a circular cross section is described. It consists of a means for making the products circulate in the kiln perpendicular to their longitudinal axis and means for subjecting them at the same time to a rotation about that axis by rolling on the cylindrical surfaces. The cylindrical surfaces are fast individually or in groups with at least one structure subjected to a linear movement along the longitudinal axis of the kiln. (Author abstract modified)

61232 **APTIC NO. 76150**

Wendt, J. O. L. and J. M. Ekmann

EFFECT OF FUEL SULFUR ON NOX EMISSIONS FROM PREMIXED FLAMES (FINAL REPORT). *Arizona Univ., Tucson, Dept. of Chemical Engineering, Environmental Protection Agency Grant R-802204, Program Element 1AB014, ROAP 21ADG-021, Rept. EPA-600/2-75-075, 90p., Oct. 1975. 25 refs.*

The effect of fuel sulfur compounds on nitrogen oxide emissions from premixed gaseous flames was investigated using a methane/air flat flame doped with sulfur dioxide or hydroogen sulfide. Fuel sulfur inhibited the formation of NOx arising from thermal fixation. This inhibition was significant at all air/fuel ratios and especially at high air preheats. The effect of fuel sulfur on NOx formation resulting from fuel nitrogen oxidation was less clear because of the complex reactions between sulfur- and nitrogen-containing species in both the flame and the sampling probe. A mathematical simulation of a flat flame showed that the observed effect of fuel sulfur on thermal NOx can be explained by a kinetic mechanism involving the catalysis of atom recombination reactions by SO2. Thus, fuel desulfurization may lead to increased NOx emissions according to the above findings. (Author abstract modified)

61233 **APTIC NO. 83918**

Wheeler, Mary Anne and Max Bettman

ON THE POISONING OF CO3O4 CATALYSTS BY ALUMINA AND MAGNESIA. *J. Catalysis, 40(1):124-128, Oct. 1975. 11 refs.*

Alumina-doped and magnesia-doped cobaltous-cobaltic oxide, (Co3O4) were prepared and tested for catalytic activity relative to that of pure cobalt oxide. The specific catalytic activity of the Al2O3 doped Co3O4 was poisoned by a factor of 8. The sample had a surface which was highly enriched in aluminum concentration, relative to the bulk. The outermost surface layers of the magnesium doped samples were impoverished in Co and enriched in Mg. Alumina supported Co3O4 had a peculiarly low catalytic activity for the oxidation of carbon monoxide and hydrocarbons compared to pure Co3O4. These supported catalysts were made by impregnation with aqueous cobalt nitrate, followed by calcination to 500-600 C. This temperature was insufficient to produce profound bulk interdiffusion between catalyst and support in the solid state and a Co3O4 phase was left.

61234 **APTIC NO. 81760**

Wiklander, Lambert

THE ROLE OF NEUTRAL SALTS IN THE ION EXCHANGE BETWEEN ACID PRECIPITATION AND SOIL. *Geoderma, 14(2):93-105, 1975. 7 refs.*

The reduction of soil acidification resulting from acid precipitation by the addition of neutral salts was studied. The salt effect was caused by a cation exchange occurring after the entry of the rain water into the soil. The acid components of precipitation consisted of sulfuric acid, nitric acid, and hydrogen chloride; ammonium ion was also an acid component after nitrification in the soil. The magnitude of the salt effect depended on the relative bonding energy of the hydronium ion and of calcium, magnesium, sodium, potassium, and ammonium cations in the soil as well as on the concentrations of hydronium ion and the above cations in precipitation. The salt effect was considerable in very acid soils and decreased with rising pH, becoming very small or negligible in neutral soils due to the increasing bonding energy of the hydronium ion in this direction. The adverse effect of acid precipitation is thus likely to be less in very acid soils such as podsols than in slightly acid or neutral soils with low buffering capacity against pH changes. Soil texture and calcite content are very important factors in this respect since fine material and calcite increase the buffering. (Author abstract modified)

61235 **APTIC NO. 81804**

Williams, M. M. R.

CONDENSATION AND EVAPORATION OF A DILUTE VAPOUR ON A SPHERICAL DROPLET. *Z. Naturforsch., vol. 30a:134-141, 1975. 7 refs.*

A mathematical analysis of the condensation and evaporation behavior of a dilute vapor on a spherical droplet is derived. The description of such behavior possesses important implications in aerosol growth and in environmental pollution studies. A Boltzmann equation is formulated so that the condensation rate can be calculated. An approximate method is developed which uses the integral form of the transport equation to express the condensation rate in a form which includes any type of vapor-gas interaction. An expression for the heat flux to the droplet is also obtained, and a method for calculating the vapor density and temperature is outlined.

61236 **APTIC NO. 76418**

Wolf, Friedrich, Werner Hoese, and Helmut Fuertig

SORPTION OF HYDROGEN AND METHYL MERCAPTAN ON ZEOLITIC MOLECULAR SIEVES. I. STATIC ADSORPTION OF HYDROGEN SULFIDE AND METHYL MERCAPTAN. *(Zur Sorption von Schwefelwasserstoff und Methylmercaptan. I. Statische Adsorption von Schwefelwasserstoff und Methylmercaptan). Text in German. Chem. Tech. (Berlin), 27(6):362-364, June 1975. 31 refs.*

The equilibrium adsorption capacities of synthetic, type A and X zeolitic molecular sieves for hydrogen sulfide and methyl mercaptan were studied as a function of the cation form, the degree of ion exchange, and the temperature, by the BET method. The H2S adsorption capacity of ion-exchanged type A molecular sieves was found to increase in the order of barium A, potassium A, strontium A, cobalt A, nickel A, zinc A, manganese A, sodium A, magnesium A, and calcium A. Maximal H2S adsorption was observed for CaA at the ion-exchange degrees of 48% and 64%, especially in the temperature range of 50-64%. As could be expected, the corresponding equilibrium adsorption capacities for H2S and methyl mercaptan were somewhat higher on NaX and KNaX type molecular sieves than on the corresponding type A molecular sieves. The former are superior to CaA at low temperatures and at higher H2S partial pressures only.

61237 **APTIC NO. 82454**

Wolf, Friedrich, Werner Hoese, and Helmut Fuertig

STUDY OF THE SORPTION OF HYDROGEN SULPHIDE AND METHYL MERCAPTAN ON ZEOLITHIC MOLECULAR SIEVES. II. DYNAMIC ADSORPTION OF HYDROGEN SULFIDE FROM VARIOUS GASEOUS MEDIA. *(Zur Sorption von Schwefelwasserstoff und Methylmercaptan an zeolithischen Molekularsieben. Teil II: Dynamische Adsorption von Schwefelwasserstoff aus verschiedenen gasfoermigen Medien). Text in German. Chem. Tech. (Berlin), 27(9):541-543, 1975. 17 refs.*

Factors influencing the adsorption of hydrogen sulfide on zeolitic molecular sieves type A and X from different gaseous mixtures (nitrogen, carbon dioxide, propane) were studied under dynamic conditions. The temperature and hold time had but negligible influence on H2S adsorption at temperatures below 100 C and at hold times 3 sec. Molecular sieve NaX caused the oxidation of H2S; consequently it is unsuitable for its adsorption, while molecular sieves CaA and CaX are suitable for the removal of H2S from gases. The presence of simultaneously adsorbable gases reduced the H2S adsorption considerably. The adsorption of H2S can be intensified by lowering the temperature and by increasing the hold time unless these parameters facilitate the adsorption of other adsorbable substances.

61238 **APTIC NO. 76435**

Wright, H. A. and R. N. Hamm

ELECTRON ATTACHMENT TO SO2 IN HIGH-PRESSURE GASES. *In: Health Physics Division Annual Progress Report. Energy Research and Development Administration, Oak Ridge, Tenn., Oak Ridge National Lab., Contract W-7405-eng-26, Rept. UC-41, p. 103-105, Sept. 1975. 7 refs.*

NTIS: ORNL-5046

The attachment of slow (less than or equal to 10 electron volts) electrons to sulfur dioxide embedded in nitrogen (300-25,000 torr), ethylene (200-15,000 torr), and argon (500-2000 torr) gases was investigated. At electron energies of less than or equal to 0.5 electron volts, the sulfur dioxide anion is formed via a nuclear-excited Feshbach resonance mechanism, with the rate of its formation being strongly dependent on both the density and the nature of the gaseous medium. The absolute electron attachment cross sections possess two maxima at 0.06 and about 0.28 electron volts which are attributed to electron capture into vibrational levels of the SO2 anion. The probability of stabilization the SO2 anion in collisions with C2H4 and N2 is about 60 times larger for C2H4 than for N2. The autodetachment lifetime of the SO2 anion at thermal energies is an estimated 2 times 10 to the -10 sec or greater. At higher energies (4-10 electron volts), SO2 attaches electrons dissociatively. The cross section for dissociative attachment to SO2 possesses a primary maximum of 5 electron volts and a secondary one at about 8 electron volts.

61239 **APTIC NO. 70565**

Wu, C. H. and H. Niki

METHODS FOR MEASURING NO2 PHOTODISSOCIATION RATE. APPLICATION TO SMOG CHAMBER STUDIES. *Environ. Sci. Technol., 9(1):46-52, Jan. 1975. 32 refs.*

The photodissociation of nitrogen dioxide by absorption of solar radiation in the 3000-4000 A region plays a key role in atmospheric chemistry, particularly in the formation of photochemical smog. The primary photodissociation rate constant serves as a convenient measure of the intensity of ultraviolet radiation in laboratory studies as well as in the atmosphere. Several methods which have been used previously for the determination of this constant were evaluated on the basis of convenience and feasibility for use in the smog studies. The kinetics and mechanism of nitrogen dioxide photolysis at ppm levels in 760 torr nitrogen or air were studied in detail using a 45-liter bell jar reactor. Concentration-time profiles of the reactant NO2 and the products nitric oxide and ozone were monitored continuously by the NO-O3 chemiluminescence method. The decay of NO2 in N2 deviated from first-order behavior; this was most noticeable in the early stages of photolysis when the yield of NO was less than a few percent. Thus, the commonly used method based on the assumption of first-order decay is not applicable. Alternative kinetic expressions were derived and validated, and the values of the relevant rate constant ratios were obtained. In the photolysis of NO2 in air, the attainment of a photostationary state for NO2, NO, and O3 was observed, and the photodissociation rate could be determined from this relationship. Data obtained under various conditions were analyzed in terms of an 11-step mechanism using numerical integration techniques. A set of rate constants was derived which can adequately describe the photolysis of NO2 at ppm levels either in N2 or in the air. (Author abstract modified)

61240 **APTIC NO. 82922**

Yanagihara, Shigeru, Isamu Shimada, Eiichi Shinoyama, Keizo Saito, Fumitake Chisaka, and Takeshi Ishii

PHOTOCHEMICAL REACTIVITIES OF HYDROCARBONS. *(Tanka suiso no kokagaku hannosei). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):265, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov, 5-7, 1975, Paper 2.)*

The photochemical reactivity of 65 sample hydrocarbons with nitrogen oxides was studied. Two ppm hydrocarbons and 1 ppm NOx were irradiated with an ultraviolet ray for 5 to 6 hr at 30 C at 55% relative humidity. The photochemical reactivity was determined by measuring the nitric oxide, nitrogen dioxide, NOx, ozone, hydrocarbon, formaldehyde, and peroxyacetyl nitrate levels in the chamber. The oxidation rate of NO was found to be closely related to the ozone formation rate; the correlation factor for these two rates was 0.98. The NO oxidation rate was governed by the number of carbon atoms in the paraffinic hydrocarbons, and the rate generally increased with an increased number of carbon atoms. The reactivity of the olefinic hydrocarbons was affected by the structure rather than the number of carbon atoms in the hydrocarbons. The number of alkyl substituents on aromatic hydrocarbons governed their reactivity. The reactivity of aromatic hydrocarbons with an olefin substituent and more than two alkyl substituents was very large, although the reactivity of paraffinic hydrocarbons with more than 4 carbon atoms could not be ignored.

61241 **APTIC NO. 84190**

Yanagihara, Shigeru, Isamu Shimada, Eiichi Shinoyama, Keizo Saito, Fumitake Chisaka, and Takeshi Ishii

PHOTOCHEMICAL REACTIONS OF THE AUTO-EXHAUST, EFFECTS OF FUEL COMPOSITION. *(Jidosha haiki no kokagaku hanno, nenryo sosei no eikyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):269, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Japan, Nov. 5-7, 1975, Paper 6.)*

The effect of gasoline composition on automobile exhaust gas photochemical reactions was studied. Gasoline with components from 0.6 to 20% and aromatic components from 14 to 50% were used. Using a domestic automobile on a dynamometer, the exhaust gas was collected and diluted in a 12 cu m smog chamber to give 5 ppm of the initial total hydrocarbon concentration and 0.7 ppm nitrogen oxides. The chamber was irradiated by 300 block lights at 30 C and 55% humidity for up to 6 hr. The reacted gas was analyzed for ozone, nitrogen oxides, nitric oxide, methane, non-methane hydrocarbons, and formaldehyde. The difference in the photochemical reactivity of the exhaust gases was not highly correlated with difference in gasoline composition. Increased olefin components in gasoline increased reactivity; however, no difference was observed in gasolines containing more than 20% aromatic components. The formation of formaldehyde was not affected by the type of gasoline, and the formaldehyde concentration in the smog chamber after 6 hr irradiation was between 35 and 40 pphm regardless of the type of gasoline used.

61242 **APTIC NO. 84667**

Yanagihara, S.

PHOTOCHEMICAL REACTION OF NITROGEN OXIDES AND HYDROCARBON. *(Chisso sankabutsu to tankasuiso no kokagaku hanno). Text in Japanese. PPM (Japan), 6(8):89-98, Aug. 1975. 1 ref.*

Reactions of nitrogen oxides (about which our knowledge is insufficient) and hydrocarbons are considered. Experiments which explain the formation of ozone as a result of HC-NOx photochemical reactions are described. If conditions for initial concentrations of NOx and HC (excluding methane are right, it is at least possible to reduce the maximum O3 concentration to below 0.1 ppm. If maximum O3 reduction is estimated to be 0.1 ppm, its initial concentration must be kept lower than 0.2 ppm in order to realize such concentrations. There are still many unsolved problems in making such measurements; it is not just the formation of O3 which is brought about by photochemical reaction of HC-NOx.

61243 **APTIC NO. 83196**

Yano, Toshiaki, Ken ichi Ito, and Shoichi Fukazawa

EXHAUST EMISSIONS FROM AN AUTOMOBILE GASOLINE ENGINE DURING A WARMING-UP OPERATION UNDER COLD TEMPERATURE. *(Jidosha yo gasorin kikan no teion danki chu no haishutsu gasu ni kansuru kenkyu). Text in Japanese. Hokkaido Daigaku Kogakubu Kenkyu Hokoku (Bull. Fac. Eng., Hokkaido Univ.), no. 77:13-24, 1975. 3 refs.*

Characteristics of fuel consumption, carbon monoxide, and hydrocarbon emissions during low temperature warmup operations were studied experimentally in a low temperature chamber, with a water-cooled, 4-cylinder, 4-cycle automotive gasoline engine (displacement, 1584 cc; compression ratio, 8.7; using regular gasoline with 91.2 octane rating). A semi-automatic choke mechanism was used, in which the choke valve and the throttle valve were connected. Engine operations were studied when temperatures reached -10 C. Warmup was completed when engine coolant water reached a temperature of 80 C. Normal idling conditions were at room temperature, 20 C; engine coolant water temperature, 75 C. Appropriate control of the air-fuel ratio, with rising temperature in the engine coolant water, resulted in fuel economy and a decrease in pollutant emissions. Air-fuel ratios between 10-11 were effective from -10 C to 0 C. Above 0 C, theoretical mixture ratios were suitable. Optimum warmup manipulations resulted in reductions in fuel consumption (75%), CO emissions (65%), HC emissions (95%), during driving operations with the choke entirely closed. Amounts of fuel consumption, CO, and HC emissions during -10 C-0 C, comprised a very high percentage of the total amounts involved.

61244 **APTIC NO. 84210**

Yasuoka, Takashi and Shunmei Mitsuzawa

PHOTOCHEMICAL REACTIVITY AND IONIZATION POTENTIAL OF ORGANIC COMPOUNDS. *(Yukikagobutsu no ionka denatsu to kokagaku hanno sei ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 10(4):268, 1975. (Presented at the National Air Pollution Research Conference, 16th, Niigata, Nov. 5-7, 1975, Paper 5.)*

The photochemical reactivity of hydrocarbons is considered in relation to the ionization potential of hydrocarbons, oxidation rate of nitric oxide, and ozone generation. The plot between the ionization potential and logarithmic NO oxidation rate showed that increased ionization potential decreased the NO oxidation rate for alkanes, alkenes, and alkane-substituted benzene compounds. The maximum concentration of ozon generation during photochemical reactions had the same relation with the ionization potential as hydrocarbons; decreased ionization potential accompanied by increased maximum concentration of ozone generation.

61245 **APTIC NO. 80473**

Yeung, Columba K. K. and Colin R. Phillips

HYDROCARBON CONSUMPTION AND SYNERGISTIC EFFECTS IN PHOTOOXIDATION OF OLEFINS. *Environ. Sci. Technol., 9(8): 732-737, Aug. 1975. 20 refs.*

Single, binary, and tertiary mixtures of ethylene, propylene, and cis-2-butene are irradiated in the presence of nitrogen oxides in air. There are excess rates and synergistic effects in the photooxidation of olefins. Olefins react readily with reactive intermediates generated by hydrocarbon reactions. The reactivity of an olefin is increased when mixed with more reactive olefins and decreased when mixed with less reactive olefins. This emphasizes the value of selective control of the more reactive hydrocarbons in the air quality control as a means of reducing the absolute reactivity of the reactive hydrocarbons and minimizing the reactivities of other less reactive components. (Author abstract modified)

61246 **APTIC NO. 79330**

Yokota, K., M. Hayafuku, A. Kobayashi, K. Nakano, and T. Ohira

PHOTOCHEMICAL REACTION OF AUTOMOBILE EXHAUST GAS. *(Jidosha haiki gasu no kokagaku hanno). Text in Japanese. Tokyo-To Kogai Kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), no. 6:23-31, 1975. 3 refs.*

Exhaust gases from a 4-cycle, 4-cylinder, water-cooling, gasoline engine at idling and 8-mode city driving were studied for their photochemical reactivities. The gases were irradiated in a smog chamber with black light and fluorescent light (2:1) for 6 hours. Nitrogen oxides in the resulting gas were analyzed by chemiluminescence method and Saltzman method and ozone by chemiluminescence method. Total hydrocarbon (THC), methane, carbon monoxide and propylene were analyzed by gas chromatography, and formaldehyde by chromotropic acid method. Results showed that formation of ozone began when the NO2 concentration reached its maximum value. The concentration of formaldehyde, aliphatic aldehydes and CO increased with increasing time of irradiation. The concentrations of these major products of the irradiation also increased with increasing initial concentration of THC. The reactivity of the exhaust gas depended greatly on the composition. Propylene, 1,2,4-trimethylbenzene, ortho-ethyltoluene and xylene showed higher reactivities while ethane, ethylene, pentane, toluene and ethylbenzene showed lower reactivities.

61247 **APTIC NO. 84084**

Yuzefovich, G. E. and V. A. Telipko

KINETICS OF THE CATALYTIC OXIDATION OF CARBON MONOXIDE BY NITROUS OXIDE ON CHROMIC OXIDE-CUPRIC OXIDE CATALYST. *(Kinetika kataliticheskogo okisleniya okisi ugleroda zakidyu azota na okisnom hromovomednom kontakte). Text in Russian. Izv. Akad. Nauk Kaz. SSR, Ser. Khim., no. 5:21-28, Sept.-Oct. 1975. 17 refs.*

Experimental studies showed that the velocity of catalytic oxidation of carbon monoxide by nitrous oxide on a chromic oxide-cupric oxide catalyst satisfied an equation of the first order for the interval of temperatures 160 - 240 C, and did not depend on the concentration of the nitrous oxide. The influence of oxygen on the speed of the reaction depended on the conditions of the reaction; in particular, on the temperature and the oxygen concentration. Nitrous oxide and oxygen increased the speed of the reaction.

61248 **APTIC NO. 81695**

MECHANISM OF NITROGEN OXIDE GENERATION. *(Issanka chisso no hassei kiko). Text in Japanese. Toyota Chuo Kenkyusho R D Rebyu (Toyota R and D Review), 11(1):80-89, Sept. 1975. 21 refs.*

A general discussion is given on the mechanism of nitric oxide formation. Exhaust gas from an uncontrolled internal combustion engine at medium or high load contains 2000-6000 ppm nitric oxide and 40-50 ppm nitrogen dioxide. Comparison of the change of NO concentration by calculation with results from kinetic studies and the observed values obtained by spectrophotometric methods reveals that both the formation and decomposition of NO are disequilibrium reactions. The formation of NO occurred mostly in the combusted gas. At a 40 deg crank angle, a 200 deg difference in temperature was found between the combusted gas elements in the initial stage and those of the final stage. The rate of NO formation from the gas elements was the greatest for a normal mixture gas and the concentrations of the gas elements were also the highest. The concentrations of the gas elements decreased at higher or lower mixture gas concentrations and they became unreactive at approximately 80 deg after the upper dead point.

1974

61249 **APTIC NO. 83525**

Barrere, M.

TURBULENT COMBUSTION MODELS. *(Modeles de combustion turbulente). Text in French. Rev. Gen. Thermique (Paris), 13(148):295-308, April 1974. 10 refs.*

In the field of turbulent combustion processes, theoretical studies have achieved significant results by focusing on undulating laminary flame fronts, combustion in pockets, and combustion in a flow with low relative turbulence. These data are very useful in establishing modern fuel chambers. The determination of the combustion efficiency of high speed fuel chambers, pollution production, and combustion noise were examined. The important influence of turbulence are flow heterogeneity in a fuel chamber on the production of pollutants are discussed.

61250 **APTIC NO. 79593**

Blanchard, Duncan C. and Lawrence D. Syzdek

IMPORTANCE OF BUBBLE SCAVENGING IN THE WATER-TO-AIR TRANSFER OF ORGANIC MATERIAL AND BACTERIA. *J. Rech. Atmospheriques, 8(3-4): 529-540, July-Dec. 1974. 29 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

The importance of bubble scavenging in the water to air transfer of organic material and bacteria is discussed. The effect of bubble scavenging of dissolved surface active material in sea water is visible with the unaided eye when an air bubble bursts and ejects jet drops into the air. The adsorption of surface active material onto the surface of a bubble lowers the surface free energy. The heights to which the jet drops are ejected decreases with increasing bubble age. Experiments with bubbles rising through suspensions of the bacteria Serratia marcescens, and a suspensions of the many species of bacteria found in the Hudson River, show that bubble scavenging results in an increase in jet drop bacteria that is directly proportional to the distance the bubble moves through the water. A few centimeters of bubble scavenging doubles the amount of bacteria in the jet drops. (Author abstract modified)

61251 **APTIC NO. 75994**

Blann, Dale D., Ken A. Green, and Larry W. Anderson

DESIGN, FABRICATION, AND INSTALLATION OF A PARTICULATE AERODYNAMIC TEST FACILITY (FINAL REPORT). *Aerotherm/Acurex Corp., Mountain View, Calif., Environmental Protection Agency Contract 68-02-0625, Program Element 1AB012, Rept. EPA-650/2-74-103, 122p., Oct. 1974. 4 refs.*

NTIS: PB 245197/AS

The tradeoffs and design considerations, component selection criteria, and final design details for a particulate aerodynamic test facility are presented. The design meets a range of performance specifications for the test gas, including test section gas velocities to 90 ft/sec, temperatures to 450 F, and variable humidity and gas composition, including particulates. (Author abstract)

61252 **APTIC NO. 84343**

Branch, M. C.

PARTICLE FLOWS IN SHEAR LAYERS OF EXHAUST PLUMES. *Preprint, California Univ., Berkeley, Dept. of Mechanical Engineering, 5p., 1974. 12 refs.*

An analysis of particle flow in shear layers of exhaust plumes is presented in relation to phenomena relating to the chemical history of exhaust gases in an exit stream which determine the ultimate levels of contaminants emitted by jet aircraft to the atmosphere. A numerical solution is developed for the turbulent mixing flowfields and particle concentration in two phase shear layers. Coupled conservation equations for the gas phase and particle phase are solved simultaneously for the case of low relative turbulent drag when a relation between fluid and particle velocity can be determined. Typical calculations give close agreement to experimental data for axisymmetric jet and duct flow. (Author abstract modified)

61253 **APTIC NO. 76409**

Chashechkin, Y. D.

CHARACTERISTICS OF SUBMERGED TURBULENT JETS IN INHOMOGENEOUS FLUIDS. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz. Atmosfery i Okeana), 10(12):822-823, Dec. 1974. 7 refs.*

The horizontal outflow of a turbulent jet is considered. The characteristic velocity is constant in a coordinate frame in which the flow pattern is stationary. The other dimensionless quantities are functions of the distance to the source, the scale ratio (C), the Reynolds number (Re), and the internal Froude number (F). The influence of stratification can be neglected for high velocity turbulent jets. The flow is self similar at large Re, and the dependence of its characteristics on Re can be neglected. Estimates of the longitudinal coordinate dependence of the local jet Re and the internal jet Froude number are given in tabular form. The local F always decreases more rapidly than the local jet Re. An existence condition for stationary turbulence in a stratified medium is established by the Richardson number, which increases with increasing jet dimension and decreasing velocity. Eventually the largest eddies can not overcome the density barrier, and gravity suppresses vertical jet growth. The Richardson number increases rapidly for jets with a positive momentum excess. Collapse intervenes in a stably stratified medium before the turbulence inside the jet degenerates. Radiation of internal waves begins at about the time collapse begins, when F has become the order of unity. As turbulent intensity degenerates, increasingly smaller eddies cannot overcome the density barrier. Characteristics of geometrically similar turbulent jets in stably stratified media will coincide if F and C coincide.

61254 **APTIC NO. 80048**

Chusov, M. A.

RELAXATION PROCESSES IN A DEVELOPED TURBULENT FLOW. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk, SSSR, Fiz. Atmosfery i Okeana, 10(12):777- 782, Dec. 1974. 10 refs.*

It is assumed that the Reynolds stresses cannot be related to the mean flow velocity in the description of fast processes occurring in turbulent shear flows in a transient stage, but are independent dynamic variables whose evolution is described by a kind of relaxation equations. A complete system of relaxation equations is investigated as it applies to the dynamics of turbulent shear flows at various stages in their evolution. The wave stage in particular is investigated, and the quasistationary case is discussed. (Author abstract modified)

61255 **APTIC NO. 67119**

Finlayson, Barbara Jean

CHEMILUMINESCENT GAS PHASE REACTIONS OF OZONE WITH SELECTED OLEFINS. *California Univ.,* *Riverside, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1974. 340p. 46 refs.*

Laboratory experiments were performed to establish the generality of the phenomenon of chemiluminescence from low pressure gas phase ozone-olefin reactions at room temperature, to identify the light emitting species, to clarify their mechanisms of production, and to relate these to the overall mechanism of the ozone-olefin reaction. Electronically excited formaldehyde and vibrationally excited formaldehyde and vibrationally excited hydroxyl radicals were identified as emitting species common to all reactions in the presence and absence of oxygen. Light emission at 520 nm in a cis-2-butene-ozone reaction in oxygen was tentatively identified as glyoxal phosphorescence. The chemiluminescence quantum yields for the reactions of ethylene and cis-2-butene with ozone in oxygen were 10 to the minus 7 for formaldehyde fluorescence and, in the cis-2-butene reaction, 10 to the minus 4 for the glyoxal phosphorescence. The maximum value of the chemiluminescence quantum yield for the vibrationally excited hydroxyl radical was an estimated 10 to the minus 4 in these reactions. Decay curves for light intensity which are nonexponential with time in the absence of oxygen but exponential in its presence suggested that an initial fast reaction occurred, probably due in part to a mixing phenomenon. An observation of free radicals by either chemiluminescent emission or mass spectrometry in the low pressure ozone-olefin reaction suggested that a reexamination of general application of the Criegee mechanism of ozonolysis to the gas-phase reactions is necessary. (Author abstract modified)

61256 **APTIC NO. 83299**

Fissan, Heinz and Udo Boltendahl

SPECTROSCOPIC DETERMINATION OF CONCENTRATION DISTRIBUTIONS OF GASEOUS AND SOLID COMPONENTS IN A HYDROCARBON DIFFUSION FLAME. *(Spektroskopische Bestimmung von Konzentrationsverteilungen gasfoermiger und fester Komponenten in einer Kohlenwasserstoff- Diffusionsflamme). Text in German. Chem.-Ing.-Tech., 46(8):349, 1974. (The full-length text can be obtained from: Verlag Chemie GmbH, D-6940 Weinheim Postfach 1260, West Germany).*

Soot concentration distributions were measured spectroscopically in a laminar, axially symmetrical methane-air diffusion flame. The measurements were verified by measurements with a precipitation probe. Comparative measurements of the temperature distributions of the gas and soot at 9 cm flame height showed an unbalance between the soot and gas temperatures. Measurements of the soot and hydroxyl group concentrations in the flame showed no marked influence of small quantities of sodium added. The spectrophotometric method can be used for the study of soot formation processes in flames, and especially of flow and reaction processes.

61257 **APTIC NO. 83463**

Gilyazetdinov, L. P.

COAGULATION GROWTH OF SOOT AEROSOL PARTICLES. *In: Advances in Aerosol Physics. V. A. Fedoseev (ed.), No. 7, New York, John Wiley and Sons, 1974 (?), p. 49-54. 8 refs.*

The ratio of the rates of coagulation and kinetic growth of soot aerosol particles formed by the incomplete combustion of bicyclic aromatics was calculated. The rate of coagulation growth of soot particles at temperatures between 1500 and 1000 K was 100-300 times higher than the rate of kinetic growth (activation energy of 60 kilojoules/mole). A spherically oriented layer of pyrolytic carbon was formed on the particle surface at temperatures below 1500 K when the density of the growing particles was low. Soot particle structure appeared to depend on the ratio of the two growth mechanism rates.

61258 **APTIC NO. 83464**

Grankin, O. V., V. I. Chernyshov, and I. V. Kolmakov

OPERATIONAL DETERMINATION OF THE PARAMETERS OF POLYDISPERSE SYSTEMS. *In: Advances in Aerosol Physics. V. A. Fedossev (ed.), No. 7, New York, John Wiley and Sons, 1974 (?), p. 55-62. 4 refs.*

A method for determining the particle size density distribution of a polydisperse system which can be described by a gamma distribution is presented. The density distribution determination is made from data on small angle scattering diagrams and spectral transmittance. Comptuer calculations show some relationship between the characteristic coordinates of the optical information as well as between the density distribution parameter and distribution moments. (Author abstract modified)

61259 **APTIC NO. 80176**

Haque, R. and N. Ash

FACTORS AFFECTING THE BEHAVIOR OF CHEMICALS IN THE ENVIRONMENT. *In: Survival in Toxic Environments. M. A. Q. Khan and John P. Bederka, Jr. (eds.), New York, Academic Press, 1974, p. 357-371. 25 refs.*

Factors affecting the behavior and transport of chemicals in the environment are discussed. Once a chemical is introduced into the environment its behavior depends on the surrounding environment and the physical-chemical properties of the chemical. The chemical is transported in the hydrosphere, lithosphere, atmosphere, and biota. The vapor pressure of a compound primarily determines its transport into air. The vapor pressure values of some environmentally important chemicals are tabulated. Vapor pressures vary over a wide range. Organophosphates and some carbamates possess appreciable vapor pressures, whereas DDT, dieldrin, and lindane are low vapor pressure compounds. The vapor pressure value gives a good estimate of the transport of the chemical as long as it is in the free state or evaporating from an inert surface. The vapor loss depends strongly on the adsorption of the chemical on the surfaces of soil constituents.

61260 **APTIC NO. 82103**

Iinuma, Kazuo and Yoshimasa Iba

FLAME PROPAGATION AND POLLUTANT REDUCTION IN GASOLINE ENGINES. *(Gasorin kikan ni okeru kaen denpa to osen busshitsu no teigen). Text in Japanese. Nippon Jidosha Kenkyusho Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 30:13-22, Sept. 1974. 5 refs.*

The promotion of flame propagation by a jet flow of the air-fuel mixture, and spatial and time changes of concentrations of intermediate products were studied. With high-speed Schileren photography, pressure changes and flame propagation phenomena were studied for propane-air mixtures (nitial pressure 3 kg/sq cm), blown through single or multiple holes (1 hole, 6 mm diameter, through 10 mm thickness; 24 holes, 2.5 mm diameter, through 5 mm thickness), in a synthetic resin board which sectioned off one part of the combustion bomb, near the ignition source. Times for flame propagation (distance 12 cm) and pressure rise (to 17 kg/sq cm) were as follows: For single hole, times for flame propagation and pressure rise were both 10 ms. For multiple holes, flame propagation time ranged from 25-35 ms; pressure rise time ranged from 35-55 ms. No partition resulted for a flame propagation time of 45 ms, and pressure rise time of 60 ms. For single-hole partition, the maximum jet velocity of the unburned air-fuel mixture was about 15 m/s, and the flame propagation velocity exceeded 30 m/s. A turbulent jet of the unburned gas mixture was formed ahead of the flame. Change from turbulent to laminar flame propagation can occur with time. Results of studies on a modified L-head engine were as follows: There were CH and C2 radiations occurring in the flame region. Strong OH and nitric oxide radiations were found in the fuel gas region, after passing through the flame region. Maximum NO radiation was reached long after passing through the flame region; NO radiation time and intensity decreased at distances further away from the ignition plug. For dilute fuel mixtures, NO radiation time increased, but no differences were observed between 1000 rpm and 2000 rpm. Flame propagation patterns for 2-cycle engines for the most part resembled those for 4-cycle engines. Calculations, not heretofore published, were made of adiabatic flame temperature and equilibrium mole fraction of combustion products of methanol (liquid; air pressure 1 atm; initial temperature 298 K; equivalence ratio 0.5-2.0).

61261 **APTIC NO. 83846**

Inota, Koichi, Akiko Sawamura, Hiroaki Tanita, Toshio Imai, Hiroshi Morita, Tadashi Yano, and Tsdashi Honda

STUDIES ON SEASONAL FLUCTUATION OF AEROSOL NUCLIDE BY ACTIVATION ANALYSIS. *(Hoshaka bunseki ni yoru earosoru kakushu no kisetsu hendo ni kansuru kenkyu). Text in Japanese. In: Report of Atomic Pile Cooperative Use and Research. Rikkyo Univ. (Japan), p. 67-69, 1974.*

The intensity of background radiation (radon and thoron) is higher in winter and lower in summer. In order to investigate the relationship between this phenomenon and seasonal variation of aerosol nuclide, the air samples (suspended particulates, rain water, cloud particles, thawed snow) were analyzed by the analysis method. Samples were collected at five locations in Hokkaido. Descriptions of sampling method, irradiation method by the short period irradiation (3-5 min) and long period irradiation (6 hr) and measurement method using Ge(Li) detector by the 4K wave-height analysis method are given. Measurement data were processsed by the PEAKFIND software for gamma ray analysis. Examples of analysis data of long period irradiation samples (background, standard and suspended particulates samples) are given. In this study, the adequacy of sampling method and sample preparation method were evaluated, which indicated that the sampling conditions used were sufficiently adequate for activation analysis.

61262 **APTIC NO. 73362**

Ishida, Kenkji, Yukimasa Ikebe, and Michikuni Shino

DETERMINATION OF PARTICLE SIZE DISTRIBUTION OF THB AEROSOL. *(ThB earozoru no ryukei bunpu sokutei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 12:79-85, 1974. 4 refs.*

The characteristics of dynamic and static methods for measuring particle size distribution of aerosols based on diffusion phenomena are reviewed. The procedure and apparatus used for particle size distribution measurement of thorium-B aerosol are described with flow sheets. The analysis method using Gormley and Kennedy's equations and results of Th activity distribution obtained are given. From the relative distribution of ThB activity, the relative distribution of atmospheric aerosol can be calculated. To evaluate the reliability of measured distribution, the ThB aerosol distribution and non-radioactive atmospheric aerosol distribution were measured simultaneously, and the distribution calculated based on ThB aerosol measured and non-radioactive aerosol distribution measured were in fairly good agreement. The radon-A aerosol distribution measured and the RaA aerosol distribution calculated based on the non- radioactive aerosol distribution measured were also in good agreement, supporting the reliability of measured values.

61263 **APTIC NO. 81832**

Jager, J. and M. Rakovic

SULPHUR-DIOXIDE-INDUCED QUALITATIVE CHANGES IN POLYCYCLIC AROMATIC HYDROCARBONS ADSORBED ON SOLID CARRIERS. *J. Hyg. Epidemiol., Microbiol. Immunol. (Prague), 18(2):137-143, 1974. 8 refs.*

A chromatographic analysis of the products resulting from the reaction between sulfur dioxide, pyrene, and benzo(3-4)pyrene adsorbed on power plant fly ash carrier was performed. Spots detected on chromatograms were cut out and analyzed for their sulfur content by means of neutron activation analysis. The main reaction products were sulfonic acids. Pyrene and benzo(3-4)pyrene were sulfonated by sulfuric acid which in turn was formed by the dissolution of sulfite. The latter was produced either as a result of the catalytic action of the carrier itself (experiments in the dark) or as a result of secondary reactions of excited sulfur dioxide formed under ultraviolet light. The experiment sheds light on the nature of the reaction of polynuclear compounds with atmospheric SO2 in the presence of particulate matter.

61264 **APTIC NO. 81970**

Johansson, Thomas B., Rene E. Van Grieken, and John W. Winchester

INTERPRETATION OF AEROSOL TRACE METAL PARTICLE SIZE DISTRIBUTIONS. *Energy Research and Development Administration, Washington, D. C., Div. of Biomedical and Environmental Research and the American Nuclear Society, Isotopes and Radiation Div., Nucl. Methods Environ. Res. Conf., Columbia, Mo., 1974, p. 356-365, AT(49-7)3140. 35 refs. (July 29, 30, 31.)*

NTIS: CONF-740701

The interpretation of aerosol trace metal particle size distributions is discussed. The calculation of correlations for elemental pairs to give an indication of the degree of covariance between the elements indicates that such correlations may be particle size dependent. A high degree of covariance may be caused either by a common source or may only reflect the conservative nature of the aerosol. Regression analyses involving plots of elemental pairs and regression coefficient estimates may provide information on whether more than one source is operating for a given element in a certain size range. The analysis of aerosol size fractions; and the statistical treatment of elemental concentrations as a function of aerosol particle size may thus yield significant information on the generation, transport, and deposition of trace metals in the atmosphere. Average elemental concentrations measured at two St. Louis rooftop sites relative to average north Florida concentrations are shown as a function of cascade impactor stage for lead, titanium, potassium, and zinc. (Author abstract modified)

61265 **APTIC NO. 80842**

Koenig, A., H. Hellbach, and G. Doering

FUEL, OIL AND HIGH TEMPERATURE EFFECTS ON NOBLE-METAL OXIDATION CATALYSTS. *Preprint, Society of Automotive Engineers, Inc., New York, 8p., 1974. 12 refs. (Presented at the Automobile Engineering Meeting, Toronto, Canada, Oct. 21-25, 1974.)*

Aging tests were conducted on two monolithic noble metal oxidation catalysts on an engine using various fuels and oils, and in a furnace with an air atmosphere. The activity of the aged catalysts was determined by laboratory apparatus and related to the results of chemical analyses of the catalyst specimens. Increased temperatures always result in more pronounced catalyst aging. Temperatures above 700 C signify a severe loss of activity even if no additional poisoning influences are present. Phosphorus is the most dangerous catalyst poison of the impurities contained in the fuel. Changing from a lead and phosphorus sterile fuel to a lead free fuel in accordance with the Environmental Protection Agency specification leads to a noticeable worsening of aging results. Sulfur has no influence on long term results within the anticipated range of sulfur concentration. The choice of engine oil affects catalyst aging only slightly. (Author abstract modified)

61266 **APTIC NO. 83465**

Kunskii, V. F. and K. A. Krishtof

DEPOSITION OF A UNIPOLARLY CHARGED AEROSOL ON A SYSTEM OF EARTHED CONDUCTORS. *In: Advances in Aerosol Physics. V. A. Fedoseev (ed.), No. 7, New York, John Wiley and Sons, 1974 (?), p. 33-41. 5 refs.*

The deposition of unipolar charged particles on a system of conductors in a homogeneous electric field was investigated. The conductor system consisted of a series of earthed spheres or cylinders situated at the same altitude. Equations were derived for expressing relationships between the following parameters: field strength near the surface of the conductor, particle deposition uniformity on the conductor surface, number of deposited particles, external electric field intensity, and the geometric parameters of the system. Experiments confirmed the validity of the relationships.

61267 **APTIC NO. 81780**

Landolt, R. and R. Struckmeyer

MEASUREMENT OF BARIUM IN PETROLEUM PRODUCTS USING 2.8-MEV ACTIVATION ANALYSIS. *Radiochem. Radioanal. Lett., 16(4): 173-181, 1974. 15 refs.*

The feasibility of using 2.8-MeV neutron activation analysis for the measurement of barium in a commercially produced diesel fuel anti-smoke additive was investigated. Neutron production was achieved by means of a Cockroft-Walton accelerator equipped with a deuterium target. Neutron production was monitored by two methods. A boron trifluoride detector located a few feet from the accelerator target was used in one method. The other method involved the simultaneous activation of gold which was included in the irradiation vial containing the diesel fuel additive. The precision of the results was better than 10%. This figure may be improved by using a dual irradiation and counting system wherein a standard containing a known weight of barium is irradiated and analyzed simultaneously with the sample. (Author abstract modified)

61268 **APTIC NO. 83555**

Lovas, F. J., E. Tiemann, and D. R. Johnson

SPECTROSCOPIC STUDIES OF THE SO2 DISCHARGE SYSTEM. II. MICROWAVE SPECTRUM OF THE SO DIMER. *J. Chem. Phys., 60(12):5005- 5010, June 1974. 19 refs.*

Spectroscopic studies were made of the sulfur dioxide discharge system. Microwave spectra assignable to a dimer of sulfur oxide were detected in an electric discharge of SO2. A centrifugal distortion analysis was made of the spectra from the ground state and the lowest excited vibrational state of 16032S32S160 and the ground vibrational state of 16032S34S160. The relationship between SO and OSSO was dependent on the parent compounds supplied to the reaction system. The surface effects played an extremely important role in the formation of both SO and OSSO. With optimum operating conditions, approximately 50% of the SO2 was destroyed as it passes through the discharge zone, producing approximately 20-30% SO, 5% OSSO, and 5% S2O. (Author abstract modified)

61269 **APTIC NO. 75995**

Lundsford, Jack H.

STRUCTURE AND REACTIVITY OF ADSORBED OXIDES OF SULFUR (FINAL REPORT). *Texas A and M Univ., College Station, Dept. of Chemistry, Environmental Protection Agency Grant 801136, Program Element 1A1008, ROAP 21AJX-2, Rept. EPA-650/3-74-006, 88p., Aug. 1974. 38 refs.*

NTIS: PB 245046/AS

The structure and reactivity of adsorbed sulfur oxides and other small sulfur-containing molecules were studied. Molecules that were investigated included the anion radicals of sulfur dioxide, sulfur trioxide, a triatomic sulfur species, and carbonyl sulfide. Diamagnetic sulfite and sulfate ions, as well as covalently bonded oxides of sulfur, were also studied. The adsorbent was a high surface area magnesium oxide powder. Electronegative molecules such as SO2 adsorbed either by an electron transfer from the solid, forming a negative radical ion, or by reacting with the oxide ions of the lattice. Adsorbed SO2 anion radical was oxidized with molecular oxygen to the SO3 anion radical at room temperature. Sulfite ions were oxidized at elevated temperatures. The anion radical of carbonyl sulfide was very unstable and dissociated, presumably to elemental sulfur and carbon monoxide, at low temperatures. Elemental sulfur reacted with partially hydroxylated magnesium oxide, forming the triatomic negative ion, hydrogen sulfide, and other unidentified products. (Author abstract modified)

61270 **APTIC NO. 75966**

Miller, David F.

EXPLORATORY STUDY OF FACTORS AFFECTING AEROSOL FORMATION. *Battelle Memorial Inst., Columbus, Ohio, Columbus Labs., Environmental Protection Agency Contract 68-02-1217, Program Element 1AA008, ROAP 21AKB-09, Rept. EPA-650/3-75-002, 28p., Nov. 1974. 29 refs.*

NTIS: PB 245274/AS

A smog chamber experiment investigating the rate of sulfur dioxide conversion to aerosols was performed under clean air conditions and conditions simulating urban pollution. The rate of SO2 conversion ranged from 0.4-5.8% hr, depending on conditions. An interaction effect on SO2 oxidation was observed between relative humidity and the hydrocarbon/nitrogen oxides ratio in air contaminated with propylene, NOx, and SO2. High propylene/NOx ratios at 60% relative humidity resulted in higher overall (4-hour average) SO2 oxidation rates as well as enhanced nitric oxide oxidation. At relative humidities of 40%, doubling the HC/NOx ratios resulted in little change in the overall SO2 oxidation rates in spite of a nearly twofold increase in the NO oxidation rate. The varying SO2 oxidation rate observved in these experiments is consistent with an assortment of free radical processes whose quantitative significance must await model development and testing. (Author conclusions modified)

61271 **APTIC NO. 71837**

Mori, K., K. Utsunomiya, K. Soga, K. Shimazaki, Y. Mito, and M. Aoki

CATALYTIC REDUCTION OF NITRIC OXIDE WITH AMMONIA ON SEVERAL METAL OXIDES. *(Kinzoku sankabutsu shokubai jo deno NO no NH3 ni yoru kangen). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 9(2):415, Nov. 1974. (Presented at the National Air Pollution Research Conference, 15th, Chiba, Japan, Nov. 6-8, 1974, Paper 266.)*

Oxides of copper, nickel, cobalt, iron, manganese, chromium, or vanadium were packed in a 20 mm inside diameter quartz tube and sample gases containing 5000 ppm nitric oxide, and 12,000 ppm ammonia (He balance) were passed at 500 ml/min (space velocity 10,000/hr). The resulting gases were sampled at given intervals while the temperature of the tube was increased from room temperature to about 600 deg. Analysis of the resulting gases was by gas chromatography with thermal conductivity detector, and ammonia was titrated with hydrogen chloride. Oxides of Cu, Cr, V and Co gave high catalytic reactivities at low temperature, and V and Cu oxides showed high capabilities for NH3 decomposition. At 400 deg, 80% to 100% of the NO was removed by oxides of Cu, Co, and Cr, or by their hydrogen-reduced products.

61272 **APTIC NO. 79805**

Parungo, Farn P. and Rudolf F. Pueschel

ELEMENTAL IDENTIFICATION OF NATURAL AND ARTIFICIAL ICE NUCLEI. In: Atmospheric Physics and Chemistry Laboratory Collected Reprints 1973. National Oceanic and Atmospheric Administration, Boulder, Colo., Atmospheric Physics and Chemistry Lab., p. 75-79, Nov. 1974. (Presented at the International Conference on Nucleation, Leningrad, USSR, Sept. 23-29, 1973.)

GPO

Natural crystals were collected on a piece of black velvet in an open field. Silver iodide was used to seed clouds in a cloud chamber for collection of artificial ice crystals. The crystals were examined by scanning electron microscopy (SEM) and analyzed by X-ray. The SEM combined with an X-ray energy spectrometer (XES) can identify AgI as an ice nucleus in artificial nucleation. A natural snowcrystal nucleus is shown which contains sodium, magnesium, aluminum, silicon, and chlorine and is possibly of marine origin. The combination of XES and SEM is suitable for inventorying natural nuclei and their origins.

61273 **APTIC NO. 79049**

Pitts, J. N., Jr., W. P. Carter, K. R. Darnall, G. J. Doyle, W. Kuby, A. C. Lloyd, J. M. McAfee, C. Pate, J. P. Smith, J. L. Sprung, and A. M. Winer

DEVELOPMENT OF EXPERIMENTALLY VALIDATED MODELS OF PHOTOCHEMICAL AIR POLLUTION. *National Science Foundation, Washington, D. C., Research Applied to National Needs, Trace Contam. Conf. Proc., 2nd, Annu. Pacific Grove, Calif., 1974, p. 50-53. 17 refs. (Aug. 29-31.)*

NTIS: LBL-3217

Data on smog reactions were obtained with a solar simulator chamber for use in validating computer models of photochemical transformations involved in smog reactions. Concentration/time profiles for ozone, nitric oxide, nitrogen dioxide, formaldehyde peroxyacetyl nitrate, aldehydes, ketones, and other hydrocarbon oxygenates were obtained for the photolysis of propylene or n-butane with nitrogen oxides in air at ambient conditions and concentrations. Conventional air monitoring instrumentation was supplemented by a high resolution Fourier infrared interferometer interfaced to a 120-meter multiple reflection system in the evacuable chamber and by the analysis of chamber product mixtures with combined gas chromatography-mass spectrometry. The Fourier interferometer permitted the detection of difficult to monitor smog species such as formic acid, nitric and nitrous acid, and alkyl nitrates. The GC-MS analysis led to the detection of propionaldehyde and propylene oxide in propylene-NOx photooxidations. Computer runs directed toward modeling these data showed that additional rate and product data are required for further model refinement. (Author abstract modified)

61274 **APTIC NO. 79595**

Pueschel, R. F. and C. C. Van Valin

THE MIXED NATURE OF LABORATORY-PRODUCED AEROSOLS FROM SEAWATER. *J. Rech. Atmospheriques, 8(3-4):601-610, July-Dec. 1974. 10 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

The nature of maritime aerosols produced from ocean waters having different geographic origins was investigated. Seawater near the continental coasts contains organic matter with a great variety of moleular weights and structures, while midocean water samples (Hawaii) contain lesser, but still significant, amounts of organic substances. This organic material, dissolved or dispersed in seawater, is collected by diffusion or coalescence on the surface of air bubbles as they rise to the surface. The bursting bubble mechanism releases organic material into the air in the form of both vapor and particulate matter. Part of the organic material is attached to the seasalt particles produced by the same process, either during their formation or by coagulation and diffusion while airborne. The fractionation of inorganic ions during the bursting of bubbles at the ocean surface affects the deliquescence of the resulting sea salt particles.

61275 **APTIC NO. 83826**

Robock, Klaus

THE EFFECT OF MECHANICAL, THERMAL AND CHEMICAL TREATMENT OF SILICON DIOXIDE AND ASBESTOS DUSTS ON CYTOTOXICITY AND ELECTRON STRUCTURE. *(Die Wirkung mechanischer, thermischer und chemischer Behandlungen von Silicium-dioxid- und Asbest-Staeuben auf Zytotoxizitaet und Elektronenstruktur). Text in German. Beitr. Silikose Forsch. (Pneumokoniose), 26(3):113-262, 1974. 138 refs.*

A number of silicon dioxide dusts were produced by mechanical crushing, annealed at temperatures between 200 C and 1000 C in different gas atmospheres, and treated with cold and hot acids and lyes. Infrared spectrometry was used for structural investigations and X-ray fluorescence analysis was used for determining the contents of foreign ions. Electron microscopic and stereoscan photos provided morphological descriptions of the dusts. The cytotoxic effect on peritoneal macrophages of guinea pigs and on alveolar macrophages of rabbits was quantitatively determined by biochemical and biophysical means. To determine the electron structure of the dusts, they were excited by X-Rays under high vacuum at -196 C and the luminescence developing during the subsequent heating up was measured. The energetic position and the intensity of the luminescence indicate that the electron structure was changed as a result of the treatment. Annealing of the SiO2 dusts at temperatures above 500 C and treatment with hot soda lye and hot phosphoric acid attenuate the the cytotoxic effects of the dust as well as the electron structure.

61276 **APTIC NO. 80184**

Sehmel, G. A. and S. L. Sutter

PARTICLE DEPOSITION RATES ON A WATER SURFACE AS A FUNCTION OF PARTICLE DIAMETER AND AIR VELOCITY. *J. Rech. Atmospheriques, 8(3-4):911-920, July-Dec. 1974. 21 refs. (Presented at the International Symposium on the Chemistry of Sea/Air Particulate Exchange Processes, Nice, France, Oct. 4-10, 1973.)*

Deposition rates of airborne monodispersed particles onto a water surface were determined in a wind tunnel. Average air velocities over water were 2.2, 7.2, and 13.8 m/sec, and particle diameters ranged from 0.3 to 28 micron. For particles greater than 1 micron, deposition rates increased with both particle diameter and wind speed. For particles less than 1 micron diameter, phoretic forces were comparable to transport forces from eddy diffusion and Brownian diffusion. Minimum deposition velocities were approximately .01 cm/sec. (Author abstract)

61277 **APTIC NO. 81150**

Shishu, R. C. and L. S. Kowaczyk

THE OXIDATION OF CARBON MONOXIDE ON SUPPORTED PLATINUM. *Platinum Metals Rev., 18(2):58-64, April 1974. 14 refs.*

An isothermal differential catalyst bed was used to study the reaction rate of the oxidation of carbon monoxide on platinum catalysts used in the control of automobile emissions. The bulk phase mass transfer and pore diffusion resistance did not control the rate of catalytic oxidation of carbon monoxide on platinum. Therefore, the observed kinetics represented the true surface reaction rates. The oxidation rate showed an inhibition effect due to carbon monoxide. The differential isothermal bed data could be correlated equally well by a simple power law model and by a Langmuir Hinsheldwood dual site model. The orders of the reaction in the power law model were +1.0 with respect to oxygen and -0.5 for CO. The power law model had a limitation at low partial pressure of carbon monoxide (pCO) and high conversion as the rate became infinite for pCO approaching zero. The dual site model did not have this limitation. (Author abstract modified)

61278 **APTIC NO. 75962**

Siegel, S., H. S. Judeikis, and C. C. Badcock

THE ROLE OF SOLID-GAS INTERACTIONS IN AIR POLLUTION (FINAL REPORT). *Aerospace Corp., El Segundo, Calif., Environmental Protection Agency Grant 80140, Program Element 1A1008, ROAP 21 AJX-3, Rept. EPA-650/3-74-007, ATR-75(7441)-1, 89p., Aug. 1974.*

NTIS: PB 244413/AS

The potential importance of gas-solid interactions in polluted atmospheres was evaluated. Model calculations that employed collision theory, transition state theory, and rate constant data were used to determine the conditions under which the heterogeneous processes might compete with homogeneous gas phase reactions of importance. The heterogeneous decomposition of nitrogen dioxide and ozone as well as the heterogeneous oxidation of carbon monoxide in the presence of atmospheric particulates appeared to be significant atmospheric processes based on laboratory observations. The presence of moisture did not poison the catalytic activity of particulates in solid-gas reactions and actually enhanced catalysis in the case of NO2. Heterogeneous processes involving nitric oxide did not significantly compete with homogeneous gas phase reactions. (Author abstract modified)

61279 **APTIC NO. 81118**

Sprung, J. L., H. Akimoto, and J. N. Pitts, Jr.

NITROGEN DIOXIDE CATALYZED GEOMETRIC ISOMERIZATION OF OLEFINS. ISOMERIZATION KINETICS OF THE 2-BUTENES AND THE 2-PENTENES. *J. Am. Chem. Soc., 96(21):6549-6554, Oct. 16, 1974. 14 refs.*

Arrhenius parameters have been determined for the nitrogen dioxide catalyzed geometric isomerization of the 2-butenes and the 2-pentenes. For cis-2-butene, trans-2-butene, cis-2-pentene, and trans-2-pentene respectively E, the kcal/mole equal 11.8, 12.2, 11.2, and 12.5 and log A, 1/mole/sec equal 7.86, 7.65, 7.49, and 7.72 over the temperature ranges 298 to 366, 297 to 370, 298 to 381, and 298 to 382 K. Combinations of these results with the results of thermochemical calculations permits calculation of 298 K rate constants of NO2 addition to the double bond of ten simple olefins. These rate constants suggest that this reaction is unimportant in the bulk consumption of atmospheric olefin pollutants. (Author abstract)

61280 **APTIC NO. 81117**

Stauffer, D. and C. S. Kiang

HETEROMOLECULAR NUCLEATION THEORY FOR MULTICOMPONENT GAS MIXTURES. *Tellus (Uppsala), 26(1-2):295-297, 1974. 8 refs.*

Heteromolecular nucleation theories and their possible application to the sulfur and the nitrogen cycle are reviewed. This nucleation process involves multicomponent mixtures of gases condensing together into small liquid droplets out of the gas phase. Nucleation is generally followed by the growth of nucleated particles to larger sizes, either by homomolecular condensation or by heteromolecular condensation. The expression assumed by the homogeneous heteromolecular nucleation theory for the free energy of a droplet is given. The gaseous sulfuric acid concentration necessary for homogeneous heteromolecular nucleation may be reached in urban air; water vapor-H2SO4 heteromolecular nucleation dominates the initial particle formation for the sulfur cycle. Possible nitrogen compound candidates for heteromolecular nucleation with water in the earth s atmosphere are the addition compound NH3.SO2, ammonium sulfate, ammonium chloride, and ammonium nitrate. The relationship of this nucleation process to the total gas to the particle conversion process is discussed. For relative humidities above 100%, heteromolecular nucleation can be followed by the heterogeneous nucleation of pure water. If large aerosols are already present at the beginning, heterogeneous heteromolecular nucleation may occur at much lower trace gas concentrations.

61281 **APTIC NO. 81815**

Thompson, D.

NITRIC OXIDE FORMATION IN INDUSTRIAL COMBUSTORS. *Experientia, Suppl., 20:145-155, 1974. 15 refs.*

The formation of nitric oxide during fuel-lean premixed methane- air combustion was investigated. Good agreement was obtained between experimental and predicted NO formation rates in the post flame region close to the flame when the predicted rate was obtained by the use of reactions which are flame related only in the sense that the persistence of excess radicals must be taken into account. Reduced NO formation rates in regions further downstream were in agreement with the expectation that the high activation energy reaction responsible for NO formation near the flame is highly sensitive to decreasing temperature. Processes involving the stabilized premixed combustion of volatile fuels are expected to result in minimal NO formation at stationary sources. Alternatives to the internal combustion engine involving turbine, steam, or electrical power are recommended for the reduction of NO emissions from motor vehicle sources.

61282 **APTIC NO. 83554**

Tiemann, E., J. Hoeft, F. J. Lovas, and D. R. Johnson

SPECTROSCOPIC STUDIES OF THE SO2 DISCHARGE SYSTEM. I. THE MICROWAVE SPECTRUM AND STRUCTURE OF S2O. *J. Chem. Phys., 60(12):5000-5004, June 1974. 7 refs.*

The microwave spectrum of disulfur monoxide was reexamined. Predictions of all rotational transitions up to J equals 50 in the frequency region 10-130 GHz were obtained and the structure of the molecule was studied. A centrifugal distortion analysis was made on the ground state and lowest bending vibrational state of 34S32S160. Centrifugal distortion corrected rotational constants were obtained for 34S32S160 and 32S34S160. These observations allowed the determination of the structure: rs(S-S) equals 1.88248(10) A, r(S-O) equals 1.4637(5) A, angle SSO equals 118.26(7) deg. (Author abstract modified)

61283 **APTIC NO. 70706**

Zebel, G.

A SIMPLE MODEL FOR THE CALCULATION OF PARTICLE TRAJECTORIES APPROACHING NUCLEPORE FILTER PORES WITH ALLOWANCE FOR ELECTRICAL FORCES. *J. Aerosol Sci., 5(5):473-482, 1974. 4 refs.*

A mathematical model is described for the calculation of the trajectories of aerosol particles directed upon nuclepore filters. The model accounts for the influence of the electrical forces between the charged aerosol particles and the pore charges which are assumed to be annular. The mathematical solution of Wuest for viscous flow through a circular aperture is used for the flow field. The influence of the electrical forces is given by a dimensionless parameter which is a function of the number of elementary charges of the particle, the mobility of the particle, the electrical charge per unit length of the pore edge, the pore radius, and the flow velocity toward the filter. Some calculated trajectories are given to illustrate the effect of particle interia and electrical forces. (Author abstract modified)

61284 **APTIC NO. 84005**

Zerull, R.

DEPENDENCE OF LIGHT SCATTERING BEHAVIOR OF AEROSOLS ON PARTICLE SHAPE. *(Formabhaengigkeit des Lichtstreuverhaltens von Staubpar-*

tikeln). Text in German. 19p., 1974. 3 refs. (Ruhr- Universitaet, Bochum, West Germany.)

Problems relative to light scattering by aerosols may be roughly divided into two categories. In one case, light scattering can be calculated or measured. In the other case, the problem is the reverse. By using data from scattered light measurements, the composition of the scattering particles can be determined. The differential characteristics affecting scattering behavior are the material, shape, size distribution and spatial distribution of the particles. In order to match determinate scattering properties with a specific particle system, the influence of the differential parameters on scattering behavior must be known. Corresponding model calculations have so far been formulated for a few special particle shapes: spheres, stratified spheres and infinitely long circular cylinders, wherein variations of other parameters present no special problems. It seems that particle shape dependence of scattered light is of primary importance.

61285 **APTIC NO. 82283**

Zinchenko, I. I. and A. G. Kislyakov

OPTIMUM CONDITIONS FOR OBSERVATIONS OF TELLURIC LINES, AND THE INFLUENCE OF REFRACTION ON THEIR SHAPE. *Bull. Acad. Sci. (USSR) Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk. SSSR, Fiz. Atmosfery i Okeana), 10(12):788-791, Dec. 1974. 8 refs.*

Optimum angle relations are obtained for the observation of telluric lines against a nonresonant absorption background. Cases of line observation in absorbed solar radio emission and in intrinsic emission are considered. The two observing methods are approximately equivalent, provided that the receiver s noise temperature is low compared to the effective temperature of the received radiation. The smallest observable increment in the optical thickness of the atmosphere due to a telluric line is then 10 to the -8 power to 10 to the -9 power. The optimum radiometer bandwidth for observation of faint telluric lines is estimated. The dispersion of the atmosphere s refractive index in the telluric line region is calculated and thee line contour distortions due to refraction are estimated. (Author abstract)

61286 **APTIC NO. 81083**

Tokyo Metropolitan and Chiba Prefectural Inst. for Environmental Protection, Tokyo (Japan)

PHOTOCHEMICAL REACTIVITY OF HYDROCARBONS. *(Tanka suiso rui no kokagaku hanno chosa), p. 44-97, 1974. Translated from Japanese, 68p.*

Using vinyl fluoride bags of about 300 l volume as reaction vessels, experiments on photochemical reactions were carried out on 22 different hydrocarbon and organic solvents. Analyses of the contents were made every 30 to 60 min. Analytical methods are described for hydrocarbons, oxidates of nitrogen, ozone, and peroxyacetyl nitrate (PAN). An electronic apparatus utilizing chemical luminescence was used for analysis. Experimental data on 22 hydrocarbons using vinyl fluoride bags are presented in tabular form. The rates of nitric oxide decrease, nitrogen dioxide increase, and ozone increase were calculated. The results of irradiation of six hydrocarbons in the smog chamber are shown. Formaldehyde and lipid aldehydes were measured at 5 and 6 hr. Maximal values of concentrations were sometimes obtained before 5 hr. The rates of decrease of NO and increase of NO2 in 1 ppm NO in research grade air irradiated in a vinyl fluoride bag were 0.94 to 1.24 ppb. When not irradiated, 0.7 ppm O3 decreased by 17% in 5 hr in a vinyl fluoride bag; but the decrease was 41% when irradiated for 6 hr. When mixtures of nonmethane hydrocarbons, 1.0 ppm carbon, and 1 ppm NO, diluted with outdoor air, were irradiated in a smog chamber, the rate of decrease of NO was 3.3 ppb/min. Production of PAN, aldehyde, and ozone was quite significant. The times to obtain maximum NO2 from the vinyl fluoride bag experiment were much slower than those obtained in previous experiments. These differences may be due to the difference in concentrations, the difference between the bag and the previously used chamber, or difference in spectrum and intensity of the light sources. The bag and smog chamber experiments yielded low correlation coefficients. The ranking and absolute values of reactivity and formation of PAN indicate that contamination from inner chamber walls and diluent air may greatly influence the smog chamber results.

1973

61287 **APTIC NO. 67127**

Beauchene, J. H., P. J. Bekowies, J. M. McAfee, A. M. Winer, L. Zafonte, and J. N. Pitts, Jr.

A NOVEL OF 20 KW SOLAR SIMULATOR DESIGNED FOR AIR POLLUTION RESEARCH. *American Inst. of Aeronautics and Astronautics, American Society of Testing and Materials, and Inst. Environmental Sciences, Proc. Joint AIAA-ASTM-IES Space Simul. Conf., 7th, 1973, p. 811-825. 9 refs. (Paper 66.)*

An atmospheric chamber facility for the study of photochemical air pollution at ambient pollutant concentrations was established at the Statewide Air Pollution Research Center of the University of California, Riverside. The facility consists of two environmental chambers and a 20 KW solar simulator. The properties and detailed performance characteristics of the solar simulator are described including beam intensity, spectrum, uniformity, and collimation. The simulator was designed to the special requirements of the SAPRC facility and was subsequently built and tested. (Author abstract modified)

61288 **APTIC NO. 81844**

Boyle, J. F.

PROBLEMS ASSOCIATED WITH VANADIUM DETERMINATION IN HEAVY DISTILLATE FUELS. *In: Manual on Requirements, Handling, and Quality Control of Gas Turbine Fuel, ASTM STP 531. Philadelphia, Pa., American Society for Testing and Materials, 1973, p. 191-198. 5 refs.*

Experiences associated with the detection of trace vanadium concentrations (10 ppm and less) in heavy distillate fuels used in gas turbines are reported. The use of X-ray spectrometry for vanadium detection at these levels proved to be unsuccessful. A distillation technique for concentrating vanadium to detectable levels for X-ray analysis was developed, and the validity of the concentration technique was confirmed by an analysis of distillate bottoms to determine if the vanadium remaining in the bottoms fraction was in agreement with the initial level as determined by wet ashing procedures.

61289 **APTIC NO. 80283**

Chapman, Seville

MOBILITY SPECTRUM BREADTH OF INDIVIDUAL ATMOSPHERIC IONS. *Preprint, American Geophysical Union, 12p., 1973. (Presented at the American Geophysical Union Meeting, Washington, D. C., April 16, 1973.)*

The mobility spectra of ions at atmospheric pressure were investigated and showed peaks of some breadth associated with individual types of ions. The main causes of this width were: a change in the nature of the ion during the time of measurement, diffusion, possible nonplanar ion fronts created by an interleaved wire gate for admitting ions, the pulse length, the length of the measuring chamber, the distance of the electrode shield from the electrode which should equal the length of the ion pulse for maximum resolution, and miscellaneous instrumental and signal-to-noise problems. Information on the nature of atmospheric ions, the changes they undergo, and the rates of such changes can be obtained from the breadth of the observed peaks if all but the first cause of the peak width can be minimized. (Author abstract modified)

61290 **APTIC NO. 80218**

Fjeld, Robert A., Robert J. Heinsohn, Samuel H. Levine, and Gary W. Malamud

MATHEMATICAL MODEL OF A PARTICLE CHARGING SCHEME UTILIZING IONIZING RADIATION AND ELECTRIC AND MAGNETIC FIELDS. *Pennsylvania State Univ., University Park, Dept. of Mechanical Engineering and Center for Air Environment Studies, Environmental Protection Agency Grant TD900011, Rept. CAES 338-73, 127p., Dec. 1973. 43 refs.*

Electrostatic methods, in which particles acquire an electric charge in a partially ionized gas and are either detected by changes in electric current or collected by an electric field, are used in both measurement and control of air pollution. A particle charging scheme is described in which ionizing radiation and a magnetic field are utilized to create regions of dense ionization and an electric field is used to separate the charge. Other particle charging schemes are reviewed. A mathematical model has been formulated to predict the charging capabilities of the proposed scheme and to provde a basis for the modeling of similar radiation charging schemes. It consists of three parts: ion production due to ionizing radiation, ion distributions due to an externally applied electric field, and charging of particles in bipolar ion regions. As applied to flow in a rectangular duct, the model predicts the existence of optimum parameters in order to achieve maximum charging. These consist of an optimum applied field for a given ion generation rate and an optimum ion generation rate for a given applied field. (Author abstract modified)

61291 **APTIC NO. 81955**

Gouldin, F. C.

HOMOGENEOUS GAS PHASE REDUCTION OF NO IN COMBUSTION SYSTEMS. *Cornell Univ., Ithaca, N. Y., Cornell Energy Project, National Science Foundation Grant GI-29903X1, Paper 73-11, 11p., Dec. 1973. 5 refs.*

Large driving forces for nitric oxide reduction can be obtained in fuel rich combustion gases at temperatures around 2000 K. Zel dovich kinetics are studied to determine whether or not reaction rates in this temperature range are fast enough in practical systems to be of interest. An equation is derived for the change in amount of NO in terms of the amounts of NO and molecular nitrogen and oxygen present and the rate constants for two reactions involving these substances and the dissociation of N2 and O2. Characteristic reaction times are obtained for two special cases, one of which is generally appropriate for typical rich combustion conditions. Characteristic times of .1 sec and below are obtained for temperatures above 2000 K. A hot soak period of .1 sec at temperatures around 2000 K would be needed for NO reduction. Such hot soak periods are possible in magnetohydrodynamic generator systems and specially designed large steam boilers. (Author abstract)

61292 **APTIC NO. 67154**

Haury, G. and S. Jordan

CATALYTIC OXIDATION OF SO2 ON AEROSOLS. *(Katalytische Oxidation von SO2 an Aerosolen). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 62-65. (Oct. 17-18.)*

The catalytic oxidation of sulfur dioxide in nitrogen and oxygen mixture by manganese sulfate, iron sulfate, and sodium chloride aerosols was studied. At an SO2 concentration of 5 mg/cu m, the aerosol concentration and median particle size were about 10 mg/cu m and 1.2 micron, respectively. The rate of catalytic oxidation amounted to 10% per hour. The catalytic activity of sodium chloride aerosols was much lower than that of manganese sulfate and iron sulfate aerosols. The rates of oxidation were found to be dependent on the relative humidity. Under a definite limit, ranging from 80 to 90% depending on the type of the aerosol, the latter were solid and contained no more than 5% water. The reaction time of the aerosol particles was very short. At relative humidities below 50%, the reaction was practically independent of the SO2 concentration, and was determined only by the aerosol concentration.

61293 **APTIC NO. 67168**

Hochrainer, D. and G. Zebel

SEPARATION OF AEROSOL PARTICLES BY DIFFUSING GASES. *(Zur Frage der Abscheidung von Aerosolteilchen durch diffundierende Gase). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 147-149. 3 refs. (Oct. 17-18.)*

Experimental study of the separation of aerosol particles from gaseous mixtures by diffusiophoresis, and the implications of this phenomena for particle separation in the lung are described. Two different gases with latex particles 0.82 micron in diameter were sent through parallel canals with a diaphragm filter between them in a diffusion chamber, after which the composition of the two gases was determined by means of Jamin helium-neon laser interferometer. In the case of equimolar counterdiffusion, the rates of aerosol separation on the carbon dioxide side in the CO2-oxygen, CO2-hydrogen, and CO2-air systems was higher than on the opposite side by 11, 61, and 5.3 times, respectively, which is indicative of the entrainment of the particles by the heavier gas. This implies inhibition of the particle separation by CO2 released by tissues in the lung. In the case of diffusion with equal pressure in the diffusion chamber, corresponding to a respiratory coefficient of 0.84, facilitation of the particle separation by diffusiophoresis was observed. The diffusiophoresis was much weaker in this case than during equimolar counterdiffusion. The effect of diffusiophoresis on particle separation in the lung is believed to be insignificant due to the very small concentration gradients occurring there.

61294 **APTIC NO. 67062**

Ishizaki, Chanel and John T. Cookson, Jr.

INFLUENCE OF SURFACE OXIDES ON ADSORPTION AND CATALYSIS WITH ACTIVATED CARBON. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 13(1):51-53, 1973. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 165th, Dallas, Tex., April 8-13, 1973.)*

Results are presented from experiments investigating the influence of surface oxides on adsorption and catalysis with activated carbon. The adsorbent (Filtrasorb 200) was prepared from coal by high temperature steam activation, while the surface of the carbon was modified by outgassing at high temperature followed by dry oxidation with oxygen at several temperatures (20-500 C) and by room temperature oxidation in aqueous solution of ammonium persulfate. The adsorbates studied were: n-butyl mercaptan, butyl disulfide, decane, p-hydroxybenzaldehyde, and glycine. Adsorption equilibrium for all adsorbates from dilute aqueous solution on the original as well as the outgassed and oxidized carbons was described by the Langmuir equation, with the values of the monolayer coverages being on the order of a few micromoles/sq m. The kinetics of adsorption for n-butyl mercaptan, butyl disulfide, decane, an p-hydroxybenzaldehyde fitted a second-order reversible equation, with affinity of the untreated carbon being the highest for butyl disulfide. Activated carbon in the presence of oxygen catalyzed the oxidation of n-butyl mercaptan to butyl disulfide, and both adsorbates competed for sites. The experiments indicated that while the rate of adsorption for the adsorbates was extremely influenced by the surface oxides, the capacity on an area basis was not.

61295 ***APTIC NO. 84448***

Mirzabekyan, G. Z.

KINETICS OF COAGULATION OF BIPOLARLY CHARGED PARTICLES. (Kinetika koagulyatsii bipolyarno zagryaznennykh chastits). Text in Russian. Izv. Akad. Nauk SSSR, Energ. Transp., no. 3:73-83, May-June 1973. 10 refs.

The coagulation kinetics of bipolarly charged particles of polydispersed aerosols was studied by a computerized mathematical method. Computations of the electrocoagulation kinetics of bipolarly charged particles with uniform particle size and charge distribution revealed that at a mass concentration of 2-5 g/cu cm, and in case of charge in a corona discharge field, the mean particle mass increased several times in a few seconds, i.e., all particles are practically coagulated. The approximate calculation method is applicable for aerosols with size and charge variation coefficients greater than 0.25, and the error does not exceed 10%. The experimental data are in good agreement with the calculations. The experimental and computation results indicate the expediency of the use bipolar charge for the electrocoagulation of particles.

61296 **APTIC NO. 83049**

Moser, William R.

FUNDAMENTAL APPROACHES TO NITRIC OXIDE DISPROPORTIONATION VIA TRANSITION METAL DINITROSYL COMPLEXES. *Preprint, Esso Research and Engineering Co., Linden, N. J., Corporate Research Labs., 6p., 1973 (?). 1 ref.*

The use of transition metal dinitrosyl complexes to catalyze the disproportionation of two molecules of nitric oxide to molecular nitrogen and oxygen was investigated. Group VIB and VIII transition metal dinitrosyl complexes were synthesized by the reaction of gaseous nitric oxide with metal salts or complexes. All of the transition metal dinitrosyls decomposed to varying amounts of nitrogen, nitric oxide, and nitrous oxide. First row metal dinitrosyls typically decomposed to 85% N2O and 15% N2. Second and third row metal dinitrosyls decomposed mainly to N2 along with some N2O and NO. In some cases rapid quantitative conversions to N2 alone were observed. Increasing the electron density on the central metal atom invariably resulted in faster overall rates of decomposition and a greater preference for the formation of N2. Studies on a well-defined, X-ray determined dinitrosyl compound revealed a clean decomposition to N2 and indicated that a cis-coplanar dinitrosyl micro-structure with one bent (activated) and one linear nitrosyl is essential to the direct disproportionation of NO to N2 and O2.

61297 **APTIC NO. 81808**

Nommik, Hans

ASSESSMENT OF VOLATILIZATION LOSS OF AMMONIA FROM SURFACE-APPLIED UREA ON FOREST SOIL BY N-15 RECOVERY. *Plant Soil, 38(3): 589-603, June 1973. 26 refs.*

The extent of ammonia volatilization loss from nitrogen-15-labeled urea applied to the floor of a pine stand was assessed using vertically isolated micro-plots. Urea materials of two different sizes were used: small granulated pellets (280 pellets per gram) and tablets (2.06 g each). The nitrogen application rate was 200 kg/hectare. The ammonia volatilization losses for the small pellet urea and the tablet form were 24.9% and 12.1%, respectively, after 13 days of exposure. The corresponding figures after 31 days of exposure during which the total precipitation amounted to 14 mm were 15.1% and 26.9%, respectively. Nitrogen from the urea in tablet form diffused to a greater soil depth than did nitrogen from urea in small pellets. Nitrogen from the latter was largely recovered in the litter layer. Tablet urea was subjected to the highest leaching loss upon exposure to heavy rain. The addition of 10 wt% of metaphosphoric acid or sublimed sulfur to the table urea did not reduce volatilization loss.

61298 **APTIC NO. 83920**

Olberg, M.

LOCAL VARIATIONS OF THE GEOMETRICAL PROPERTIES OF STREAM LINES AND TRAJECTORIES IN NONSTATIONARY HORIZONTAL FIELDS OF FLOW IN THE ATMOSPHERE. *Idojoras (Budapest), 77(5):279-283, Sept.-Oct. 1973. 6 refs.*

Local variations of the geometrical properties of streamlines and trajectories in nonstationary horizontal fields of flow in the atmosphere were calculated. In nonstationary horizontal fields of flow without divergence, the local rates of change of the curvatures of the streamline and trajectory are equal to the product of the scalar value of the velocity and the change of the difference between these curvatures/unit length in the direction of the streamline and trajectory, respectively. Fields of flow without rotation allow the representation of the velocity vector by the gradient of a potential. In the case of potential motion fields, the curves orthogonal to the stream lines are lines of constant velocity potential.

61299 **APTIC NO. 67156**

Penzhorn, R. D.

AEROSOL FORMATION BY IRRADIATION OF SO2, NO AND HYDROCARBONS IN THE AIR. PART I: STUDY OF THE CHEMICAL PROCESSES. *(Aerosolbildung durch Bestrahlung von SO2, NO und Kohlenwasserstoffen in der Luft. Teil I: Untersuchung der chemischen Prozesse). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 70-71. (Oct. 17-18.)*

The chemical reactions taking place in various combinations of oxygen, nitric oxide, sulfur dioxide, and cis-2-butene under elevated partial pressure in white light were studied in a model experiment by means of a laser aerosol spectrometer. In the SO2-air and SO2-nitirc oxide-air systems there was no aerosol formation in darkness. By irradiation of 0.677 or 0.33 mbar SO2 in air at a wavelength of over 3000 Angstrom, a maximum particle concentration of 400 and 240/cu m, respectively, were measured after 48 hrs. The reaction product obtained was identified as sulfuric acid formed due to UV excitation of SO2 in singulet state. The rate of particle formation increased considerably in the presence of NO, where the native oxygen formed by photolysis can react with molecular oxygen, nitrogen dioxide, and SO2. The reaction product was identified as sulfuric acid. While there was no particle formation in NO-cis-2-butene systems, the presence of SO2 caused intense aerosol formation with H2SO4 as the main reaction product. Carbon dioxide, acetaldehyde, and nitrous oxide were also identified. The formation of aliphatic sulfur compounds is also possible.

61300 **APTIC NO. 67068**

Pitts, James N., Jr., Alan C. Lloyd, and Jeremy L. Sprung

CHEMICAL REACTIONS IN URBAN ATMOSPHERES AND THEIR APPLICATION TO AIR POLLUTION CONTROL STRATEGIES. *Beckman Instruments Process S.A., Geneva (Switzerland), Proc. Int. Symp. Environ. Meas., Geneva, Switzerland, 1973, p. 27-61. 121 refs. (Oct. 2-4.)*

The complex interactions among the various elements of the air pollution system are reviewed. There is a need for a more extensive and reliable data base which would define the ambient levels, chemical and physical interactions, and the toxic effects of air pollutants more accurately. The history and effects of smog are discussed. The health effects of smog, the composition of sulfate particulate, sulfur dioxide synergism, effects of smog on plants, and economic effects of smog are reviewed. The primary air quality standards and emission standards for motor vehicles and stationary sources are also discussed. Societal controls for pollution are reviewed, including transportation control plans such as parking fees and gasoline rationing, smog alerts, and health warning systems. The emission of primary pollutants includes automobile exhausts (carbon monoxide, oxides of nitrogen, hydrocarbons, and particulates) and fuel-burning sources (NOx and sulfur oxides). Emission inventories are necessary to determine the relative contributions of various sources and to evaluate and develop control programs. The three-dimensional structure of smog and the atmospheric chemistry of smog are described, and the following subjects are included: secondary pollutants; smog formation; the conversion of nitric oxide to nitrogen dioxide; thermal oxidation of NO; photooxidation; ozone formation; hydrocarbon photooxidation; the importance of hydroperoxy and hydroxyl radicals and hydrogen atoms; the reaction of HO2 and aldehydes; reactions of HO and nitrous acid; reactions of H atoms, ozone, and olefins; photochemical aerosols; computer models; smog chamber experiments; and ambient air monitoring.

61301 **APTIC NO. 76242**

Popov, N. P., M. G. Leusheva, and R. M. Serebryanaya

CALCULATION OF THE AMOUNT OF FOG FORMED DURING CONCENTRATION OF PHOSPHORIC ACID. *Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 5(3):191-192, March 1973. 2 refs.*

An equation for determining the probable quantity of phosphoric acid fog formed in a concentrator is derived. The process of concentrating extractive phosphoric acid to 52-54% and 72-76% phosphorus pentoxide was studied in lined vessels supplied with bubbler tubes which were connected to the exhaust of a high intensity fuel-burning furnace. The flue gases after the bubbler tube traveled through a bath of acid and then entered an absorption unit for purification together with steam, fog, phosphoric acid spray, and fluorine-containing compounds. The effects of the following factors on the quantity of phosphoric fog formation were studied: final concentration of the acid to be evaporated, temperature of the flue gas in the bubbler tube, gas speed, depth of the tube in the acid bath, and volume ratio of acid in the unit to the entering flue gas. The equation developed allows for calculating the quantity of fog formed in the concentrator for given hydrodynamic conditions at a given temperature.

61302 **APTIC NO. 84353**

Ropars, J.

DETERMINATION OF METALLIC IMPURITIES IN HEAVY FUEL OILS BY ATOMIC ABSORPTION METHOD. *(Dosage des impuretes metalliques dans les fuels-oils lourds par absorption atomique). Text in French. Analusis, vol. 2:199-203, 1973. 7 refs.*

Vanadium, sodium, and nickel were directly determined by atomic absorption spectrophotometry using the technique of adding a defined dose of the metals to the samples to be analyzed. The solutions were prepared either with sodium chloride or sodium cyclohexanebutyrate; the solvent used was methylisobutylcetone. An acetylene air flame was used for sodium and nickel, and nitrogen acetylene-protoxyde for vanadium and nickel. The procedure determined vanadium concentrations around 40 mg/kg, 10-15 mg/kg for sodium, and 3.2-3.5 mg/kg for nickel. Compared to the method of ash dosage by calcinating the samples, the direct determination method produced slightly higher results (45 and 54 ppm for sodium, 55 and 57 for vanadium, and 17 and 17 for nickel, for one sample). Present studies involving vaporization in an oven, by using the technique of added defined doses, should achieve a sensitivity 10 to 20 times greater than that of hollow cathode or high brightness lamps.

61303 **APTIC NO. 67158**

Schoeck, Werner

AEROSOL FORMATION BY IRRADIATION OF SO2, NO AND HYDROCARBONS IN THE AIR. PART II: STUDY OF THE AEROSOL-PHYSICAL PROCESSES. *(Aerosolbildung durch Bestrahlung von SO2, NO und Kohlenwasserstoffen in der Luft). Teil II: Untersuchung der aerosolphysikalischen Prozesse). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 77-80. 2 refs. (Oct. 17-18.)*

The rate of aerosol formation and particle size distribution were studied as a function of the concentration and composition of the original substances and of the radiation intensity in different combined systems of sulfur dioxide, nitric oxide, and butene at high concentrations but low radiation intensity corresponding to 0.001% of the solar constant. In a mixture composed of 0.33 mbar SO2, NO, and cis-2-butene each in air with 70% relative humidity, a stationary state with constant particle concentration and particle size distribution established itself in two days. All particles disappeared upon cessation of the irradiation, while renewed irradiation resulted in quantitative recombination of the particles. During irradiation, sufficient supersaturation is achieved, whereby droplet aerosol particles are condensed spontaneously and homogeneously. The reaction products formed in the further course of the irradiation are condensed on the existing droplets, which results in a particle growth with constant particle concentration. The resulting sedimentation leads to the spontaneous formation of new, homogeneous condensed nuclei, and equilibrium is reached after a certain time between the settling and newly condensed droplets. Under the conditions of increased irradiation intensity, the range of particle size distribution will increase, there will be no particle concentration peak, and the particle concentration will decrease. The particle concentration was highest in the SO2-NO-butene system, while the NO-butene system supplied no detectable aerosol. The concentration maximum was dependent only on the relative composition of the initial substances, not on their absolute partial pressure.

61304 **APTIC NO. 79231**

Sheindlin, A. E., N. I. Gorbunova, and Y. A. Sarumov

THE ENTHALPY OF N2O4 NEAR THE CRITICAL STATE. *High Temp. (English translation from Russian of: Teplofiz. Vys. Temp.), 11(6):1067-1071, Nov.-Dec. 1973. 5 refs.*

The enthalpy was measured by direct heating during flow calorimetry for the reversible gas reaction in which nitrogen tetroxide (N2O4) forms nitrogen dioxide. The equipment used is described. Forty-nine values have been derived on isobars for 50, 75, 100, 102.3, 125, 150, 200, and 300 kgf per sq cm between 340 K and 400 K. (Author abstract modified)

61305 **APTIC NO. 67080**

Siekhaus, W. and T. Novakov

STUDY OF SO2 ADSORPTION ON A STEPPED PLATINUM SINGLE CRYSTAL SURFACE BY PHOTOELECTRON SPECTROSCOPY. *California Univ., Berkeley, Lawrence Radiation Lab., Atomic Energy Commission Contract W-7405-ENG-48, 6p., March 1973. 1 ref.*

Sulfur dioxide was adsorbed at room temperature, under UHV conditions on a stepped single crystal surface of platinum, and observations were made with X-ray photoelectron spectroscopy. The observed energies and intensities of oxygen, sulfur, and platinum photoelectron lines showed the SO2 to decompose at the Pt surface to form a surface sulfide. The sulfur is chemisorbed on the surface via electron transfer from Pt to S. Only a small fraction of that oxygen stays on the surface, probably in the molecular form. The O2 fragment leaves the surface in about 75% of the SO2 adsorption events leading to the sulfide formation. (Author abstract modified)

61306 **APTIC NO. 81803**

Smith, I. W.

RATE PROCESSES IN PULVERIZED FUEL COMBUSTION. *Preprint, CSIRO Minerals Research Labs.,* *North Ryde, New South Wales (Australia), Div. of Mineral Chemistry, 8p., 1973. 23 refs. (Presented at the Australasian Conference on Heat and Mass Transfer, 1st, Melbourne, Australia, May 23-25, 1973.)*

Rates of combustion, burning temperatures, and the development of pore structure were measured for various fine (less than 100 micron) pulverized fuel chars burning at 1200-2200 K. The temperature measurements revealed that carbon is removed from the particles as carbon monoxide rather than as carbon dioxide. The burning rates of pulverized fuel char particles were influenced only slightly by the diffusion of oxygen from the bulk gas to the outer surface of the particles. The dominant influences in rate control were the processes of pore diffusion and chemical reaction on pore walls. (Author abstract modified)

61307 **APTIC NO. 67120**

Smith, Jerome Paul

REACTIONS OF SULFUR DIOXIDE IN THE PRESENCE OF NITROGEN DIOXIDE AND PROPYLENE. *Colorado Univ., Boulder, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1973, 161p. 117 refs.*

Reactions of sulfur dioxide in the presence of nitrogen dioxide and propylene were studied along with attempted product identifications. The rate of SO2 photooxidation was greatly accelerated in the presence of both NO2 and propylene, with the rate of SO2 disappearance being as high as 0.02 ppm/min. Increasing the propylene concentration from 3 ppm to 12 ppm while holding the NO2 concentration constant at 1.7 ppm and SO2 at 2 ppm increased the rate of the SO2 reaction, whereas increasing the NO2 concentration from 0.9 to 10.2 ppm while holding the propylene concentration constant at 6 ppm decreased the SO2 reaction rate. Relative humidity at 50% did not affect the photochemical reaction of the three compounds, though 75% relative humidity caused a rapid dark reaction. A mixture of 2 ppm SO2, 1.2 ppm NO2, and 6 ppm propylene produced much aerosol upon irradiation, while a mixture containing 2 ppm SO2, 6 ppm propylene, and 5.5 ppm NO2 produced no aerosol upon irradiation and no measurable SO2 reaction upon irradiation. A mixture containing 6 ppm propylene, 1.2 ppm NO2, and no SO2 also produced no aerosol upon irradiation. No identifications were made of the wall products from the photochemical reaction or of the aerosol formed from the photochemical reaction.

61308 **APTIC NO. 81857**

Vetlygina, N. A. and I. G. Blyakher

SYNTHESIS OF SODIUM BISULFITE AND SODIUM PYROSULFITE BY ABSORPTION OF SULFUR DIOXIDE IN A COLUMN WITH MOBILE PACKING. *Sov. Chem. Ind. (English translation from Russian of: Khim. Prom.), 5(3):189-191, March 1973. 6 refs.*

The synthesis of sodium bisulfite and sodium pyrosulfite by the absorption of sulfur dioxide in a column with mobile packing was studied. The value of the mass transfer coefficient increased with a rise in the static height of the bed, the number of beds, and the gas rate. A column with at least two beds was needed for the production of standard sodium bisulfite, while optimum results for the production of sodium pyrosulfite were obtained with a three-bed column. In the latter case, an increase in the gas rate from 2.6-3.0 m/sec brought about a sharp rise in the degree of purification of the gas and in the mass transfer coefficient.

61309 **APTIC NO. 84362**

Villalobos, Richard and John N. Harman, III

USE OF AN AUTOMATED GAS CHROMATOGRAPH IN SMOG CHAMBER STUDIES. *In: Air Quality Instrumentation. Selected Papers from International Symposia, presented by the Instrument Society of America, John W. Scales (ed.), Vol. 2, Pittsburgh, Pa., Instrument Society of America, 1974, p. 42-58. 9 refs. (Presented at the International Symposium of the Analysis Instrumentation Division of the Instrument Society of America, 16th, May 23-25, 1973.)*

The use of an automated gas chromatograph for studying photochemical hydrocarbon reactivity in an irradiated smog chamber is reported. The effect of various initial evels of carbon monoxide on the rate of ethylene and propylene photochemical reactivity was studied in a system which also contained nitrogen oxides. A Beckman Model 6800 Air Quality Gas Chromatograph was used to measure the hydrocarbon components and carbon monoxide, and a chemiluminescent analyzer was used for NOx detection. Decay curves for the hydrocarbons and nitric oxide were observed along with a rise and decay of nitrogen dioxide and the appearance of CO. The data also showed that methane was generated as a product of the photochemical reaction.

61310 **APTIC NO. 83338**

Wirth, Endre, Katalin Bonis, and Antal Simon

LABORATORY INVESTIGATIONS OF SILVER IODIDE AEROSOLS. *(Ezust-jodid aeroszol laboratoriumi vizsgalata). Text in Hungarian. Idojaras (Budapest), 77(2):97-109, March-April 1973. 13 refs.*

Pure silver iodide smoke was produced in an aerosol chamber by heating the material on a wolfram wire. Both the actual size distribution of the particles and the captation efficiency of the last stage of a Casella impactor were determined. Nuclei were examined by electron microscopy. The typical concentration was 80,000/cu cm; 20,000/cu cm of which originated from the heater wire and the natural background aerosol. The lognormal distributions were characterized by r (median) equals 0.11 micron and standard deviation equals 1.64. The changes in the distributions due to coagulation and artificial dilution of the aerosol were analyzed. The density of individual particles equalled 0.71 g/cu cm.

61311 **APTIC NO. 81764**

Zaghloul, R., M. Obeid, and H. Staerk

NONDESTRUCTIVE ACTIVATION ANALYSIS OF ARAB CRUDE OILS. *Radiochem. Radioanal. Lett., 15(6):363-372, 1973. 12 refs.*

Vanadium, sulfur, sodium, and bromine in Arab crude oil samples were determined by neutron activation analysis. The technique was based on a series of consecutive irradiations and analyses of individual activities using gamma-ray spectrometry. Gamma activity was measured with a multi-channel gamma-ray spectrometer using a germanium/lithium detector and a sodium iodide/thallium crystal. Errors due to neutron self-shielding and shadow effects caused by high cross section components of the samples and enhancement of thermal flux by moderation of epithermal neutrons within aqueous samples were minimized by using very small sample amounts (200 microliters). Both samples and corresponding standards were irradiated under the same conditions. Vanadium, bromine, sodium, and sulfur levels ranged from 9.52-51 ppm, 0.15-0.36 ppm, 0.06-0.31 ppm, and 1.2-3.1%, respectively. The data obtained were probably very close to actual values since the neutron activation method used did not require any thermal treatment which can result in element losses by evaporation. (Author abstract modified)

61312 **APTIC NO. 67157**

Zerull, R.

MICROWAVE ANALOGY EXPERIMENTS ON LIGHT SCATTERING BY NONSPHERICAL DUST PARTICLES. *(Mikrowellenanalogieversuche zur Lichtstreuung an nicht kugelfoermigen Staubpartikeln). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus- Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 72-76. 6 refs. (Oct. 17-18.)*

The scattering functions of spheres with rough surfaces, cubes, and octahedrons were studied by microwave analogy experiment, in multiplying both the wavelength and the particle size by an identical factor of an order of magnitude of 10,000. Individual scattering bodies hanging on a thin nylon cord were irradiated, and the scattered radiation was received by a rotary receiving antenna. For spheres with rough surfaces, the deviation in the scattering behavior from spheres with smooth surfaces was negligible in both monodisperse and polydisperse mixtures. There were major differences in the scattering behavior of spheres and cubes as well as octahedrons. An essentially isotropic scattering behavior persisted at high scattering angles in the case of cubes, and the intensity in the medium angle ranges was larger than for spheres by nearly one order of magnitude, but no increase in the backward scattering was observed. The polarization behavior of cubes was essentially neutral, while dielectric mixtures caused negative polarization. The increase in the intensity in the medium ranges of the scattering angle was less pronounced for octahedrons than it was for cubes.

61313 APTIC NO. 67077

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD METHOD OF TEST FOR CHLORINE IN COAL. *Book ASTM Stand., vol. 19:372-374, 1973. 6 refs.*

Standard D 2361-66 is presented for measuring the total chlorine content of coal. The method consists of oxidation of the sample by combustion and absorption of the chlorine in alkaline reagents. The method, apparatus, reagents, procedure, calculations, and precision of the method are described.

61314 APTIC NO. 67078

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD METHOD OF TEST FOR TOTAL SULFUR IN NATURAL GAS BY HYDROGENATION. *Book ASTM Stand., vol. 19:424-427, 1973. 2 refs.*

Standard D 3031-72 is presented for determination of the total sulfur in natural gas by hydrogenation. The method covers determination of S in natural gas containing not more than 1.0 grain of S/100 cu ft and not more than 0.5% of C_5 and heavier hydrocarbons. A measured sample of gas is mixed with humidified hydrogen and passed over a platinum gauze at 900 C in a tube furnace. Organic sulfur in the gas is converted to hydrogen sulfide, which is absorbed in a zinc acetate solution and determined by the methylene blue procedure. The method, apparatus, reagents, calibration, procedure, calculation, and precision of the method are discussed.

1972

61315 APTIC NO. 44049

Albertin, F. and B. Querzola

PROPAGATION OF LASER BEAMS THROUGH THE ATMOSPHERE. *(Propagazione di fasci laser attraverso l atmosfera). Text in Italian. Alta Freq., 41(3):121-133, March 1972. 88 refs.*

Findings of some of the most significant studies on the characteristics of laser beams, on the behavior of laser beams propagating through the atmosphere, and their attenuation by absorption are reviewed. The propagation of electromagnetic waves produced by a laser source in a vacuum is described. The effects (including particle scattering by fog, fumes, aerosols, rain and snow quantified by means of simplified atmospheric models, and atmospheric turbulence affecting temperature, barometric pressure, vapor pressure, carbon dioxide, and ozone in time and space) that the atmosphere produces on laser beams traversing it as expressed mathematically. A synthesis is made of statistical studies of atmospheric turbulence, covering problems and phenomena connected with the application of laser beams in telemetry and telecommunication

61316 APTIC NO. 67144

Bitterwolf, Thomas E. and A. Campbell Ling

METALLOCENE BASICITY II. REACTION OF THE FERROCENONIUM CATION WITH O_2 AND SO_2. *J. Organometal. Chem., 40(1):C29-C32, 1972. 21 refs.*

A study by Wasserman claimed the preparation of a series of stable ferrocenium adducts involving various postulated radical counter ions of the form $(HA)^-$. This claim of stable radical acid anions caused considerable consternation since it appears to violate presently known chemical behavior. Other studies gave little or no support to the presence of any species $(HA)^-$ and seemed to indicate that these adducts were simply solvated ferrocenium salts. Another study presented strong evidence against Wasserman s interpretation of room temperature electron spin resonance spectra of the uniquely prepared adduct series. A tensiometric titration of ferrocene in trifluoroacetic acid with oxygen at room temperature and pressure was conducted which confirmed the stoichiometry implied by a reaction of oxidation by oxygen. A secondary reaction of O_2 with ferrocenium occurs after the initial reaction is complete. The decomposition appears to be radical-induced. A reaction mechanism that will explain the observed oxidation is postulated which concludes that the protonated ferrocene, ferrocenonium ion, is involved in the oxidation. The anomalous reaction of ferrocene with sulfur dioxide in acid solution was also studied, and a reaction mechanism was developed. Ferrocenonium is an anti-knock agent used in gasoline.

61317 APTIC NO. 47629

Chantry, P. J.

DISSOCIATIVE ATTACHMENT IN CARBON DIOXIDE. *J. Chem. Phys., 57(8):3180-3186, Oct. 15, 1972. 26 refs.*

The production of oxygen(-) from carbon dioxide by dissociative attachment was studied with electrons having energies in the range of 0-20 eV. In addition to the two already well established peaks in the 0-10 eV range, a third peak was substantiated, at 13 eV. At room temperature the 13 eV peak cross section was approximately 6 times 10 to the minus 21st power sq cm, rising to approximately 2 times 10 to the minus 20th power sq cm at 1000 K. Measured 0- ion kinetic energy distributions corresponding to the three processes peaking at 4.4, 8.2, and 13.0 eV are presented; their relevance to previous work is discussed. In all three processes only the high energy tails of the ion energy distributions are sensitive to electron energy, with a decreasingly small fraction of the available energy appearing as kinetic energy of separation of the fragments. In this respect the results are similar to previous measurements of 0- production from nitrous oxide. (Author abstract)

61318 APTIC NO. 47903

Chisaka, Fumitake, Isamu Shimada, and Shigeru Yanagihara

COMPUTER SIMULATION OF PHOTOCHEMICAL REACTION BASED ON A INFRARED SPECTRUM ANALYSIS. *(Kokagaku hanno seiseibutsu no densanki simureshon). Text in Japanese. Japan Society of Air Pollution, Proc. Symp. Japan Soc. Air Pollut., 13th, 1972, p. 58. 7 refs. (Nov. 7-9, Paper 6.)*

Propylene was used for this simulation model of hydrocarbon photochemical reaction using an electronic computer. Previously published reaction indexes were used for reference, and figures were conjectured from their experimental results. When comparing the experiments in a smog chamber with calculations, the latter showed a slower reaction initially (10 to 30 min). One reason may be the step time for calculation (6 sec). When the step time is shortened to 0.5 sec, the peak position of nitrogen dioxide agrees with the measurements rather well; but when compared with the measurements on a chemiluminescence meter, the speed of nitrogen reduction seems to be slow. The pattern of ozone formation shows drastic peaks, but they seem to agree with the measurements by a chemiluminescent O_3 meter. Peroxyacetyl nitrate infrared spectrographs are presented.

61319 **APTIC NO. 81045**

Cox, R. A. and S. A. Penkett

AEROSOL FORMATION FROM SULPHUR DIOXIDE IN THE PRESENCE OF OZONE AND OLEFINIC HYDROCARBONS. *J. Chem. Soc. Faraday Trans. I, vol. 68: 1735-1753, 1972. 26 refs.*

The gas phase oxidation of sulfur dioxide in the presence of ozone and olefinic hydrocarbons was studied at ppm concentrations. The rate of oxidation was determined by measurement of the sulfuric acid aerosol formed from radioactive 35SO2. Sulfur dioxide and ozone do not react at an appreciable rate at low concentrations, but in the presence of olefins a rapid oxidation of sulfur dioxide occurs. The kinetics of the reaction are consistent with a mechanism in which sulfur dioxide is oxidized in a fast reaction with a short lived intermediate produced in the initial reaction of ozone with the olefinic double bond. This oxidation process is of considerable significance in the atmospheric chemistry of sulfur dioxide. (Author abstract)

61320 **APTIC NO. 42912**

Crowe, C. T. and D. T. Pratt

GAS-PARTICLE FLOW IN COMBUSTION CHAMBERS. *Preprint, Combustion Institute, Western States Section, 20p., 1972. 11 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Seattle, Wash., April 24-25, 1972, Paper WSCI 72-5.)*

An iterative solution was developed to predict the two-dimensional flow field of a subsonic, particle-laden flow. The solution was based on the tank-and tube formulation of the governing equations which has been used successfully to predict the steady recirculating flow of fluids. By extending the tank-and-tube formulation to include particle momenta, the same solution scheme can be used for two-phase flows. The solutions represent the first solutions for subsonic, two-dimensional, two-phase flows which account for the mutual momenta exchange between phases. This analysis can easily be applied to the study and design of such two-phase systems as cyclone separators, electrostatic precipitators, internal flow fields of solid-propellant rocket chambers, and pneumatic transport of small particles. A particle- laden, swirling gas, flowing into a sudden expansion which simulates a coal-fired swirl burner, is presented as an example solution. The calculations predict that a smaller recirculation zone would result from using finer particles.

61321 **APTIC NO. 40923**

Dent, J. C. and J. A. Derham

A METHOD FOR CHECKING THE CONSISTENCY OF VELOCITY COMPUTATIONS FROM HOT WIRE ANEMOMETER MEASUREMENTS IN VARIABLE DENSITY FLOW. *J. Sci. Instr., 5(3):271-273, March 1972. 5 refs.*

A method is presented for checking the consistency of air velocity calculation from hot wire anemometer measurements in a variable density flow. The method gives a means of checking correction factors applied to wind tunnel calibration tests at ambient conditions, to allow for density variations in the flow. In the particular application of the method to measurements in the precombustion chamber of a motored internal combustion engine, a previously computed correction for the velocity of the mean wire temperature and gas temperature was found to be quite justified. (Author conclusions modified)

61322 **APTIC NO. 40737**

Glushko, V. N., G. S. Livshits, and B. T. Tashenov

STUDYING THE TRUE LIGHT ABSORPTION IN AEROSOLS IN THE 0.4-2.4 MICRON RANGE. *(Issledovaniye istinnogo aerozolnogo pogloshcheniya sveta v oblasti 0.4-2.4 mkm). Text in Russian. Izv. Akad. Nauk ssB, Fiz. Atmosfery i Okeana, 8(2):236-237, 1972. 3 refs.*

The absorption share due to the solid component of the aerosol particle is referred to as true aerosol light absorption. Studies were carried out with aerosols prepared under laboratory conditions and applied by a blowing operation on a mobile plate located in the center of a photometric sphere lined with a magnesium oxide layer. Three photometers constituted the measurement set: one was used for the 0.4-0.7 micron range, the second was used for the 0.7-1.1 micron range, and the third was provided with a set of interferential filters for wavelengths ranging from 1.25 to 2.42 micron. The transparency and optical thickness of the aerosol layer was determined from the transmitted light beam measurement under certain angle position s of the photometric system. Measurements were carried out with aerosol particle layers varying from 0.15 to 0.4 in optical thickness. Size data indicated that no particle overlap occurred under these optical thickness conditions when 3.0-7.0 micron particles were used. The ratio of different optical thicknesses under specific mirror angle, mobile plate position, and other photometric conditions, characterized the true light absorption of aerosols.

61323 **APTIC NO. 47654**

Kesten, A. S.

ANALYSIS OF NO FORMATION IN SINGLE DROPLET COMBUSTION. *Combust. Sci. Technol., 6(1/2):115-123, Sept. 1972. 7 refs.*

A theoretical model of nitric oxide formation in single fuel droplet combustion was developed to describe the formation of NO in the vicinity of a flame front and the diffusion and radial convection of NO away from the region of formation. Integral equation methods were used to solve for NO concentration as a function of time and radial distance from the moving boundary of the droplet. Using the model, calculations were solved for the extent of NO formation in ethanol droplet combustion. The effects of droplet size, air temperature, and pressure on NO production are illustrated. (Author abstract modified)

61324 **APTIC NO. 42175**

Kitagawa, Hiroshi

STEAM ACTIVATION OF BROWN COAL CHAR. *(Kattan no suijoki fukatsu). Text in Japanese. Nippon Kaguka Kaishi (J. Chem. Soc. Japan), no. 6:1140-1144, June 1972. 11 refs.*

The conditions to prepare active carbon from brown coal were investigated. The brown coal used was Kashima, Taiheiyo or Yallourn. The experimental conditions were as follows, carbonization temperature: 600 C, activation temperature: 700-900 C, activation time: 0.5-15 hrs, steam rate: 1.3 g/hr. The specific surface area of Kashima or Taiheiyo coal showed a maximum at about 50% weight loss and decreased rapidly with further activation. Values of specific surface area were less than 500 sq m/g. The specific surface area of active carbon from hydrochloric acid treated Kashima or Taiheiyo char increased with weight loss. Active carbons with specific surface areas of 600 sq m/g were prepared. The effect of activation temperature on specific surface area was negligible. The reactivity of HCl treated chars against steam was smaller than that of untreated ones. The yield of active carbon from HCl treated chars was higher than that from untreated chars under the same activation conditions. The specific surface area of Yallourn coal char was 400 sq m/g, which is about two times larger than other chars. Active carbons with specific surface areas of 900 sq m/g were prepared from Yallourn coal. The reactivity of brown coal against steam was much higher than that of bituminous coal. (Author abstract modified)

61325 **APTIC NO. 38178**

NcNesby, J. R., R. Byerly, Jr., Dolphus E. Milligan, and Marilyn Jacox

IDENTIFICATION OF FREE RADICALS IN SMOG MECHANISMS. *Natl. Bur. Std. (U. S.) Tech. Note, no. 711:61-62, 73, Jan. 1972. 11 refs.*

GPO: C 13.46:711

The ultraviolet spectra of methoxyl (CH30) and hydroperoxyl (HO2) radicals, believed to be important in smog-forming mechanisms, were characterized. Methoxyl was formed by vacuum-ultraviolet photolysis of methanol and its deuterium-substituted counterparts isolated in solid argon and solid nitrogen at 14 K. The highest product yields were obtained at 1470 A. The well-defined absorption due to the species in the spectral region characteristic of O-H stretching absorptions implied that the structural formula is H2C-OH. Photodecomposition of the species upon exposure to mercury-arc radiation under 2800 A indicated the presence of a continuum absorption in the 2500-2800 A region. High concentrations of HO2 in a matrix were produced by vacuum-ultraviolet photolysis of argon:oxygen:hydrogen chloride and argon:oxygen:water. However, studies of the 1800-9800 A region yield no absorption assignable to the species, nor did any decrease in HO2 absorption occur, even on prolonged irradiation with a mercury arc. Computer analysis of thee normal coordinate of the vibrational spectrum of HO2 yielded isotopic frequencies in excellent agreement with observed values. Separate infrared spectrosopic studies demonstrated that 0(-) produced by the interaction of electrons with nitrous oxide persists for a sufficient time in an argonmatrix oto permit diffusion from the site of production and reaction with N2O or with nitric oxide to produce detectable concentrations of N2O2(-) and NO2(-), respectively.

61326 **APTIC NO. 84711**

Ohkita, T. and I. Watanabe

STUDY ON GENERATION MECHANISM OF PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu hassei kiko no kaimei ni kansuru kenkyu). Text in Japanese. In: Special Report on Photochemical Smog Phenomenon by the Research Coordination Bureau, Science and Technology Agency, p. 3-7, 1972.*

An attempt was made to clarify the behavior of pollutants in chemical reactions, using smog chamber to investigate the reaction between sulfuric acid gas and ozone and the change in hydrocarbon gas concentration by ultraviolet ray. Concentrations of from 1 to 100 ppm sulfur dioxide and ozone were put into reactors. In order to measure SO2, heated hydrokinon was attached in front of the absorbing tube, to eliminate O3 but to let through SO2 without any loss. After 16.5 hr, only a little over 10% of the SO2 and O3 reacted with each other, the result corresponding to those of the experiments of Cadle et al with high concentrations. The SO2 concentration at the start was 34 ppm, 1 hr later, 32 ppm, 4 hr later, 31 ppm and 16.5 hr later, 27 ppm, while that of O3, 68, 65, - and 57 ppm respectively. It was found that neither SO2 nor O3 were lost in the pyrex glass reactor, proving its excellence. Outside air led into pyrex reactors was irradiated with ultraviolet radiation, and the decrease in concentration of various hydrocarbons contained was checked, using a perfected hydrocarbon gas analysis method. Such olefinic hydrocarbons as propylene and butanes decreased, proving that these hydrocarbons were most involved in photochemical reactions, although the behavior of cis-2-butane was considerably different from that of other butanes. Meanwhile, even after a 2-day continuous irradiation, paraffins (propane, N-butane, isobutane, N-bentane, isobentane) showed no change, proving that they had nothing to do with the photochemical reaction. The concentration of acetylene increased rapidly in the beginning; the decrease of butanes was remarkable in the initial period, but showed practically no change after a few hours. Since propylene is found in emission gas from petrochemical industry and automobile exhaust, and butanes are also found in automobile exhaust, attention must be paid on these hydrocarbons.

61327 **APTIC NO. 42082**

Sugawara, Kiyoshi and Shigeo Shimogata

WIND TUNNEL EXPERIMENT FOR ATMOSPHERIC DISPERSION. *(Fudo ni yoru mokei jikken). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 7(3):23-38, May 1972. 7 refs.*

A wind tunnel experiment was conducted to obtain air pollution concentrations in industrial and urban areas. The wind tunnel was a suction type with a wide working section; it was 1.5 m high, 3.0 m wide, and 12.0 long. Ethylene gas was diffused from a model stack on a model field in the wind tunnel, and the concentration at the downwind position was measured. The turbulence Reynolds number is controlled by a turbulence generator and surface roughness to satisfy similarity conditions. An equation for calculating gas concentrations is given. Field relations between diffusion data and wind tunnel data are described along with wind tunnel equipment. (Author summary modified)

61328 **APTIC NO. 42096**

Takase, Akira

ENVIRONMENTAL POLLUTION PROBLEM AND RADIOACTIVE TRACER TECHNIQUE. *(Kankyoosen mondai tohoshaseitoreisa-gijutsu). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 19(5):245-249, May 1972. 7 refs.*

Radioisotope tracer technique is in active use for clarifying the problems of environmental pollution. It shows chemically the same nature and action with non-radioactive natural isotopes. The tracing technique is useful because the decision of nature and estimation are possible by physical calculation instead of using chemical methods; detection and estimation of extremely small chemical amounts are possible; and detection and calculation of some specified tracers are possible. Taking advantage of these characteristics, it is used for, in the case of atmospheric pollution, intake into the respiratory system, distribution inside a body and discharge of sulfur dioxide hazards in lung tissue caused by pollution, and investigation of lung clearance. Tracers can be used as an index substance for judging cellular function. Concerning the contamination of water and food, food chain process is important and radioisotope tracers are used for alkyl mercury and ABS. The role of this method in cadmium, polychlorinated biphenyls, or agricultural chemicals has been increasing.

1971

61329 **APTIC NO. 37807**

Ashton, A. F. and A. N. Hayhurst

FLAME PHOTOMETRIC DETERMINATIONS OF DIFFUSION COEFFICIENTS. PART 3. --RESULTS FOR NITRIC OXIDE. *Trans. Faraday Soc., 67(584):2348-2353, Aug. 1971. 17 refs.*

The point-source technique for measuring gas-phase diffusion coefficients in flames, was tested using trace quantities of nitric oxide as a tracer diffusion in the burned gases of atmospheric pressure flames of hydrogen plus oxygen plus nitrogen. The air afterglow emission was used to monitor concentrations of nitric oxide. The results validate quantitatively the technique, and diffusion coefficients for NO were measured over the temperature range 1920-2520 K. These data can be accounted for with either a Lennard-Jones (12:6) potential or a purely repulsive inverse power potential function to describe interactions of a NO molecule with those of the principal flame species. A slight preference for the second potential function is indicated. With the Lennard-Jones function it is not possible to arrive at one unique pair of force constants for NO. However, values are given which can be used to calculate diffusion coefficients with reasonable accuracy. For the other potential function, repulsive forces varying inversely with separation to the 12th power fit the measured diffusion coefficient best. Values of the corresponding force constants are given. (Author abstract modified)

61330 **APTIC NO. 42459**

Cipolla, Richard Gennaro

A STUDY OF THE COMPLEXES OF SULFUR DIOXIDE AND AMINES AS DONOR-ACCEPTOR COMPLEXES. *Rhode Island Univ., Kingston, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 75p. 39 refs.*

Techniques of infrared and ultraviolet spectroscopy were used to investigate the characteristics of those complexes formed with aliphatic amines and sulfur dioxide, and to determine whether they could be described as donor-acceptor complexes according to the Mulliken theory. From charge-transfer theory, definite predictions can be made concerning changes in the spectra of the pure amines and the spectra of the corresponding complexes. The infrared spectra of all nine complexes showed two striking differences from those of the parent amines: appearance of two strong bands, which were assigned to the vibrations of the sulfur dioxide molecule, and a marked decrease in the intensity of the undisplaced carbon-nitrogen band. In each of the ultraviolet spectra of the complexes, a new peak was observed, which did not appear in the spectra of the parent amines. This peak had a direct correlation with the ionization potential of the particular amine. Various equations were suggested to describe the relationship between the ionization potential of the donor and the energy of the charge-transfer peak. Amine complexes exhibit an anomaly which can be explained by the ability of the amine donor to achieve a close approach to the sulfur dioxide acceptor. Using the spectroscopic data, the molar absorbance and the equilibrium constant at 22 C was determined for each of the complexes. (Author abstract modified)

61331 **APTIC NO. 43079**

Filby, Royston Herbert

AN INVESTIGATION OF TRACE ELEMENTS IN PETROLEUM USING NEUTRON ACTIVATION ANALYSIS. *Washington State Univ., Pullman, Dept. of Chemistry, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971, 127p. 74 refs.*

Neutron activation analysis was used to measure trace contents of nickel, vanadium, cobalt, mercury, iron, zinc, chromium, copper, manganese, arsenic, gold, antimonyg selenium, scandium, sodium, and calcium in crude oil and crude oil components. The method suffers from only minor fast neutron interfering reactions, is nondestructive, and eliminates contamination from reagents and apparatus. Sample sizes as small as 50 mg can be measured. Analyses of 10 oils showed large variations in trace element contents. All elements occurred in oil-soluble form but Na, As, and Sb occurred partly as water-soluble compounds. All elements were more concentrated in the asphaltenes than in the maltenes of the three crude oils. Components of a California oil were separated gel permeation chromatography into 300-1000, 1000-4000, 4000-8000, and 8000-22,000 molecular weight fractions. The highest trace element contents were found in the 8000-22,000 fraction of the asphaltenes and the lowest concentrations in the methanol soluble fraction of the oil. The findings are consistent with an origin of petroleum involving conversion of marine organic matter to asphaltic material followed by maturation/migration and conversion of asphaltic petroleum to paraffinic oils. (Author abstract modified)

61332 **APTIC NO. 42366**

Fischer, C. R. and P. J. Kemmey

A MOLECULAR ORBITAL CALCULATION OF THE CHARGE DISTRIBUTION OF CS2. *Mol. Phys., 22(6):1133-1135, 1971. 14 refs.*

A Hartree-Fock-Roothaan molecular orbital calculation of carbon disulfide has been performed to determine the value and sign of the quadrupole moment, and to obtain wave functions of sufficiently good quality to calculate other one-electron properties. The POLYATOM set of programs was used to obtain wave functions and to calculate the required one-electron properties of quadrupole moments, diamagnetic susceptibilities, and charge distributions. The basis set used was composed of 54 functions contracted from 194 primitive gaussians, and Slater type d functions were placed on each of the three atoms. A similar calculation was carried out for carbon dioxide to obtain an indication of the accuracy to be expected in computing molecular properties using these basic sets with the d functions. The SCF calculation was carried out using the experimentally determined C-S distance of 1.554 A and the C-O distance of 1.1612 A. The wave function for CS2 indicates transfer of negative charge away from the carbon atom. Mulliken population anaylsis yields a charge of 16.102 on the S atoms and 5.896 on the C atom; a negative value for the quadruple moment was calculated, i.e., -0.82 times 10 to the -26th power e.s.u. Since the value for the quadrupole moment is very sensitive to the details of the wave function, there may be some doubt about the reliability of the small value obtained for CS2. Further determinations of this quantity for CS2 are necessary.

61333 **APTIC NO. 76245**

Hayward, C. C., G. Oldham, and A. R. Ware

FAST NEUTRON ACTIVATION ANALYSIS OF TRACE LEVELS OF LEAD IN A NON-AQUEOUS FLOWING SYSTEM. *Radiochem. Radioanal. Lett., 6(6):381-388, 1971. 4 refs.*

A system for the fast neutron activation analysis of trace amounts of lead in non-aqueous flowing media is described. The technique is based on the use of the product isotope Pb-207 which possesses a half life of 0.80 sec. The instrumentation includes a fast neutron generator capable of generating 10 to the 11th neutrons/sec and a sodium iodide/thallium crystal detector coupled to a multichannel analyzer. Rapid transit time between irradiation and detection makes the technique less susceptible to errors caused by neutron flux variation during each irradiation. Application of the method to the analysis of 98-octane gasoline reveals a reproducibility of + or - 3% at a measured Pb concentration of 970 + or - 30 ppm.

61334 **APTIC NO. 43004**

Kotrappa, P. and C. J. Wilkinson

MEASUREMENT OF DENSITIES WITH RESPECT TO SIZE FOR SPHERICAL AEROSOL. *In: Fission Product Inhalation Program. Annual Report, 1970-1971. Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex., Rept. LF 44, UC 48, p. 24-28, Nov. 1971. 8 refs.*

NTIS: LF 44

The Lovelace Aerosol Particle Separator was used to determine the denisty of aerosol particles by measuring the particle diameter and the associated aerodynamic diameter over an aerodynamic size range of 0.3 to 3.5 micron. The density of uranine aerosol was 1.48 gm/cu cm and relatively constant with respect to size. The density of iron oxide aerosol was also relatively constant with respect to size and values ranging from 2.2 to 2.6 gm/cu cm depending upon the starting material. Fuesed clay aerosols with various radioactive labels had a range of densities from 2.0 to 2.2 gm/cu cm, and the densities were independent of particle size. Densities of aerosols of cobalt and uranium oxides produced by heat degradation were size dependent upon the starting material. The denisty of plutonium dioxide produced by thermal degradation of plutonium chloride was independent of particle size for the range studied and had an average value of 10.5, plus or minus 0.9 gm/cu cm. (Author abstract modified)

61335 **APTIC NO. 42490**

Levison, J. J. and S. D. Robinson

REACTIONS OF SULPHUR DIOXIDE, NITRIC OXIDE, AND DINITROGEN TETROXIDE WITH SOME DIOXYGEN COMPLEXES OF THE PLATINUM METALS:

FORMATION OF SULPHATO-, NITRO-, AND NITRATO-DERIVATIVES. *J. Chem. Soc., 1971:762-767, 1971. 23 refs.*

A range of sulfato-, nitro-, and nitrato-complexes of palladium, platinum, rhodium, and iridium were prepared by reaction of sulfur dioxide, nitric oxide, or dinitrogen tetroxide respectively with the appropriate dioxygen complexes of these platinum metals. The failure of nitric oxide, carbon monoxide, and carbon dioxide to react with iridium dioxygen complexes is noted. Modes of coordination of the oxy-ligands are investigated by infrared spectroscopy and apparent anomalies in the spectra of the coordinated sulfato-group are reported. (Author abstract modified)

61336 **APTIC NO. 43056**

Low, M. J. D., Nobotsume Takezawa, and A. J. Goodsel

INFRARED STUDY OF HYDROXYLS ON ACTIVE CAO. *Preprint, New York Univ., Dept. of Chemistry, 25p., 1971. 11 refs.*

Infrared spectra were recorded of calcium hydroxide samples degased at various temperatures up to 800 C. The spectral features in the 3900-3100 cm region characteristic of Ca(OH)2 were eliminated by degassing under mild conditions so that only partial decomposition occurred. The spectrum of partially or completely decomposed samples showed a strong band near 3707/cm attributed to OH(-) (Type C) of a brucite-type metastable pseudo- lattice; the defective structure of the latter suppressed the lattice vibrational modes of Ca(OH)2. Such samples, termed active CaO, readily sorbed water and their spectra showed seven hydroxyl bands. Spectra recorded after various degassings and H2O or D2O treatments point to a number of factors: the existence of free (Type A) and bound (Type B) OH(-) groups on the surface of sodium chloride-type CaO and to interactions of Type A groups with H2O; chemisorption of H2O on the pseudo-lattice, probably at OH(-) vacancy-O(--) sites, and interaction of the chemisorbed species with Type C hydroxyls; the reversible dissociation of chemisorbed H2O and its incorporation into the pseudo-lattice; and to two types of physically adsorbed water. (Author abstract modified)

61337 **APTIC NO. 43006**

Safe, S. and O. Hutzinger

CHLORINE RANDOMIZATION BETWEEN PHENYL GROUPS IN THE ELECTRON IMPACT-INDUCED FRAGMENTATION OF POLYCHLORINATED BIPHENYLS. *Chem. Commun., no. 2253:446-448, Dec. 23, 1971. 11 refs.*

The mass spectra of a series of polychlorinated biphenyls were investigated to determine the extent of chlorine randomization. Chlorine randomization occurred over both phenyl rings with the exception of 2.2 prime - and 2,6-biphenyl in which both chlorine atoms were ortho to the Ph-Ph bond. Similar results were obtained with tetrachlorobiphenyls which showed chlorine randomization in the M-Cl2 ion. (Author summary modified)

61338 **APTIC NO. 45090**

Van Pelt, Wesley R.

ATTACHMENT OF RADON-222 DECAY PRODUCTS TO A NATURAL AEROSOL AS A FUNCTION OF AEROSOL PARTICLE SIZE. *New York Univ., N. Y., School of Engineering and Science, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., 1971. 179p. 72 refs.*

The average number of radon-222 daughter atoms attached to each natural aerosol particle was measured as a function of particle diameter for diameters from 0.02 to 0.06 micron. Natural indoor aerosols were mixed with radon-222 gas and pulled through a 218 liter interaction chamber at a flow rate of 28 l/min. The radon-222 decayed successively into radium-A (polonium-218), radium-B (lead-214), and radium-C (bismuth-214), and these daughters attached to the natural aerosol particles. The particle size distribution and the resultant activity size distribution of all three decay products were measured at the interaction chamber outlet with a Whitby Aerosol Analyzer. This device reproducibly charges the aerosol with negative ions and then separates the aerosol according to electrical mobility in a right circular cylindrical electrostatic precipitator. The average number of daughter atoms per aerosol particle was proportional to the particle surface area. This result contradicts the widely accepted hybrid attachment model and is a direct consequence of the relative numbers of daughter atoms and aerosol particles. In order to properly calculate the dose to the basal layer of the bronchial epithelium for inhalation of radon daughter laden air, one must know the fraction of daughters attacked, and the size distribution of the aerosol particles to which the radioactive atoms are attached. (Author abstract modified)

61339 **APTIC NO. 40856**

Vatulya, N. M., O. A. Sukhorukov, and M. D. Ventsel

DETERMINATION OF THE ACTIVATION ENERGY OF DIFFUSION BY GAS- ADSORPTION CHROMATOGRAPHY USING A COMPUTER. *(K voprosu opredeleniya energii aktivatsii diffueii v gaeo-adsorshchtsionnoy khromatografii s ispolyeovaniem elektronnovyichislitelynyikh mashin). Text in Russian. Zh. Fiz. Khim., 45(10):2633-2635, Oct. 1971. 5 refs.*

The activation energy of diffusion of carbon dioxide in Saran carbon was determined by gas adsorption chromatography using a computer. The activation energy can be obtained by the equation C equals K-(Q-E)/RT, where K is a dimensional constant, Q is the heat of adsorption, E is the activation energy of diffusion, and C is the kinetic term of external and internal mass transfer. Saran carbon has a bulk density of 0.528 g/cu cu; the total mass volume of pores as determined by water was 0.47 cu cm/g. A 119 cm long column of 1.5 mm diameter was charged with 0.25-0.50 mm carbon particles. The column temperature was approximately 100 C. The dependence of the height of the effective theoretical plate on the flow rate of gas-carrying hydrogen was observed at 7.2-81.8 cm/sec. The data was fed into a computer. Experimental and calculated values for the height of the effective theoretical plate agreed well. At flow rates of over 40 cm/sec, mass transfer played a major role in removing the CO2 from the carbon. The dependence of the height of the effective theoretical plate on temperature was observed at 55.4 to 58.1 cm/sec. The activation energy was 3.88 kcal mole. (Author abstract modified)

1970

61340 **APTIC NO. 84350**

Gosse, Jean

A NEW DESCRIPTION OF THE COEFFICIENT OF VISCOSITY OR OF TURBULENT DIFFUSION. *(Le coefficient de viscosite ou de diffusion par turbulence dans une nouvelle description). Text in French. C. R. Acad. Sci. (Paris) Ser. A., vol. 271:1276-1279, Dec. 21, 1970.*

By expressing a relation between the turbulence viscosity coefficient and the parameters characteristic of the turbulent state, it can be concluded that the diffusion coefficient of matter or heat by turbulence can be identified with sigma (the standard deviation). The constant A was found to be equal to 5/3, a value very close to that which can be deduced from Komolgoroff s theory based on the Loitsiansky invariant of 1.7.

61341 **APTIC NO. 42142**

Kamel, Aida M., Norman D. Weiner, and Alvin Felmeister

INTERACTION OF NITROGEN DIOXIDE WITH CHOLESTEROL-LECITHIN MIXED MONOLAYERS. *Atmos. Environ., 4(5):475-480, Sept. 1970. 9 refs.*

The interaction of nitrogen dioxide with cholesterol-dipalmitoyl lecithin and cholesterol-egg lecithin mixed monomolecular films was studied. Both lecithins inhibited the NO2-induced loss of cholesterol from the films, and the degree of inhibition was directly related to the mole fraction of these lipids in the films. The dipalmitoyl lecithin was more efficient in producing this inhibition, apparently because of its greater tendency to associate with the NO2-cholesterol reaction products. A method is presented to calculate the percentage apparent loss of cholesterol from mixed films after exposure to NO2. Cholesterol may be directly involved in some of the observed in vivo effects of air pollutants on biological systems. (Author abstract modified)

61342 **APTIC NO. 43051**

Morrison, Ronald E.

A REVIEW OF ASH SPECIFICATIONS. *Bureau of Mines Information Circ., no. 8488:24-31, 1970. 9 refs. (Presented at the Ash Utilization Symposium, 2nd, Pittsburgh, Pa., March 10-11, 1970.)*

Coal ash originates as mineral matter associated with coal-forming materials and inorganic constituents added to the coal deposits from outside sources during or following coal formation. During mining, mineral matter may be inadvertently added from above or below the coal seam, or it may be mined intentionally to alter ash properties. The mineral matter may occur in many forms including shales, kaolins, sulfides, carbonates, and chlorides. The chemical composition of coal ash usually conforms to the following percentages: silica, 20-60; alumina, 10-35; ferric oxide, 5-35; calcium oxide, 1-20; magnesium oxide, 0.3-4; titanium oxide, 0.5-2.5; alkalies, 1-4; and sulfur trioxide, 0.1-12. The history of fly ash specification development in the U. S. since 1936 is briefly reviewed. The Roman use of volcanic ash is also described.

1969

61343 **APTIC NO. 36976**

Gentry, James Walter

GASEOUS DIFFUSION PROCESSES INVOLVING AEROSOL PARTICLES IN NON-CONTINUUM REGIMES. *Texas Univ., Austin, Dept. of Chemical Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., Aug. 1969., 287p. 84 refs.*

The diffusion of ions and gas molecules to aerosol particles in non-continuum regions was theoretically and experimentally investigated. The slip flow coefficent of solid aerosols in mixtures of inert gases was measured. An equation was constructed for the rate of unipolar charging of aerosols in the free and near-free molecule regions and was evaluated numerically for the special case where the interaction between the charged particle and the ions follow the law of Coulomb. Equations describing simultaneous heat and mass transfer to an aerosol particle undergoing evaporation or condensation in the transition regions were also developed. A cell model for particle growth was constructed and applied to a collection of solid particles undergoing chemical reactions, determing the influence of cell size, oxidant concentration, and spark size on mixture flammability. Evaporation of drops was also discussed. (Author abstract modified)

1967

61344 **APTIC NO. 81503**

Runkla, J. and E. Surde

EQUILIBRIUM DIAGRAM OF A VAPOR-LIQUID SYSTEM. *Tr. Tallin Politekh. Inst., Ser. A, (254), 1967. Translated from Russian, 10p.*

A three dimensional equilibrium diagram for characterizing multi- component vapor-liquid systems is described, with special reference to water distillation processes. The following systems are analyzed: a binary miscible system, a binary miscible system with saturated water vapor, and a binary miscible system with superheated steam. These systemss are represented in a three- dimensional coordinate system where the liquid phase, temperature, and saturated vapor values are laid off along the coordinate axes. This type of diagram can be constructed when the relation between the vapor pressure of the system and the temperature and concentration is known. Equilibrium relations can be found under freely selected conditions with such diagrams.

1965

61345 **APTIC NO. 82706**

Kalinin, B. Y. and E. N. Komarova

APPARATUS FOR THE STUDY OF TOXIC PROPERTIES OF VOLATILE PRODUCTS FROM PLASTICS. *(Ustanovka dlya izucheniya toksicheskikh svoystv letuchikh produktov plasticheskikh mass). Text in Russian. Gigiena i Sanit., 30(6):65-67, 1965. 1 ref.*

An apparatus designed to investigate the toxic properties of volatile products of thermo-oxidizing destruction of different plastics in dynamic conditions is described. The apparatus, used successfully for about 4 years, consists of a system that ensures the feeding of air into a reaction vessel used for thermal decomposition of the plastic in the air flow, a high-temperature bath with a thermoregulating device, and a system ensuring the transfer of the steam-gas-air mixture formed in the reaction vessel into the gas chamber, which has an independent system for the feeding of the clean air necessary for experimental animals to breathe. The device can also be used to study toxic properties of volatile products formed during pyrolysis and the depolymerization of plastics.

1964

61346 **APTIC NO. 43009**

Narasimhan, K. S. and P. J. Foster

THE RATE OF GROWTH OF SOOT IN TURBULENT FLOW WITH COMBUSTION PRODUCTS AND METHANE. *Combustion Inst., Symp. (Int.) Combust. (Proc.), 10th, Cambridge, England, 1964, p. 253-257. 6 refs. (Aug. 17-21.)*

The formation of soot when methane is rapidly mixed with air and hot combustion products was studied by means of a one-dimensional enclosed turblent flame. The experimental furnace was a steady- state plug flow reactor in which instantaneous conditions in the soot-forming regions of a practical flame could be simulated. Two regimes were distinguished: a rapid initial precipitation of soot particles during an interval of less than 10 msec and the subsequent growth of these particles without the formation of new particles. The only reaction to achieve equilibrium in 40 msec was CO2 + H2 yields CO + H2O; the significant reaction involving soot production or consumption was methane decomposition. Initial soot-particle diameters varied with the initial mixture temperature from 33 A at 1413 K to 230 A at 1763 K. The number of soot particles/ml at normal temperature and pressure ranged from 3 times 10 to the plus 10th power to 1.5 times 10 to the plus 12th power. The rate of soot growth by methane decomposition is described by an equation based on the kinetic theory bimolecular collision equation.

1958

61347 **APTIC NO. 52013**

McCaldin, Roy O.

CONTROLLED ATMOSPHERES FOR AIR POLLUTION STUDIES. *Florida Univ., Gainesville, Coll., of Engineering, Thesis (Ph.D.), Ann Arbor, Mich., Univ. Microfilms, Inc., June 1958, 162p. 79 refs.*

Design and operation of a static chamber to contain atmospheric pollutants are described. A specific method of achieving known gas concentrations and the various means by which these concentrations become reduced within the chambers are described. The static chamber affords a simpler device because less instrumentation is required to achieve a test atmosphere, and once the atmosphere is achieved, it affords a uniform aand relatively stable atmosphere with which to work. The hypodermic syringe with a needle was used to inject measured quantities of study gas into the chamber. The hypodermic syringe feed method was reasonbaly accurate for volumetric measurements. The adsorption of gas on the chamber walls was studied for sulfur dioxide, hydrogen sulfide, and hydrogen fluoride. Toxicological, bacteriological, physiological, and odor studies are reported. Calibration methods are mentioned.

1950

61348 **APTIC NO. 42950**

Parks, Thomas D. and Louis Lykken

REDUCED-SCALE METHODS FOR MICRO AND SEMIMICRO ANALYSIS. PART II. *Petrol. Refiner, 29(9):112-114, Sept. 1950. 27 refs.*

Many inorganic samples originate in motor tests or corrosion studies and consist of scrapings or deposits of unknown compositions. Reduced scale methods for the determination of silica, calcium, magnesium, tin, aluminum, sodium and potassium, silver, nickel, copper and iron, lead, and zinc are described. In deterqniirgnic samples, possible use is made of methods which are specific and rapid, and which require a minimum sample preparation. A microbalance is used when it is necessary to weigh samples or precipitates of less than 25 mg. A well-calibrated analytical balance is used for weighing samples above 25 mg. Methods which have volumetric or instrumental end points (amperometric and colorimetric) are used where possible, as they are generally more sensitive and more rapid than gravimetric procedures. For example, calcium is determined by titration with ceric perchlorate, phosphorus by titration of ammonia, aluminum by a colorimetric measurement, and lead by amperometric titration. Detailed procedures are given for silica, calcium, tin, and nickel.

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